

FIG. 4

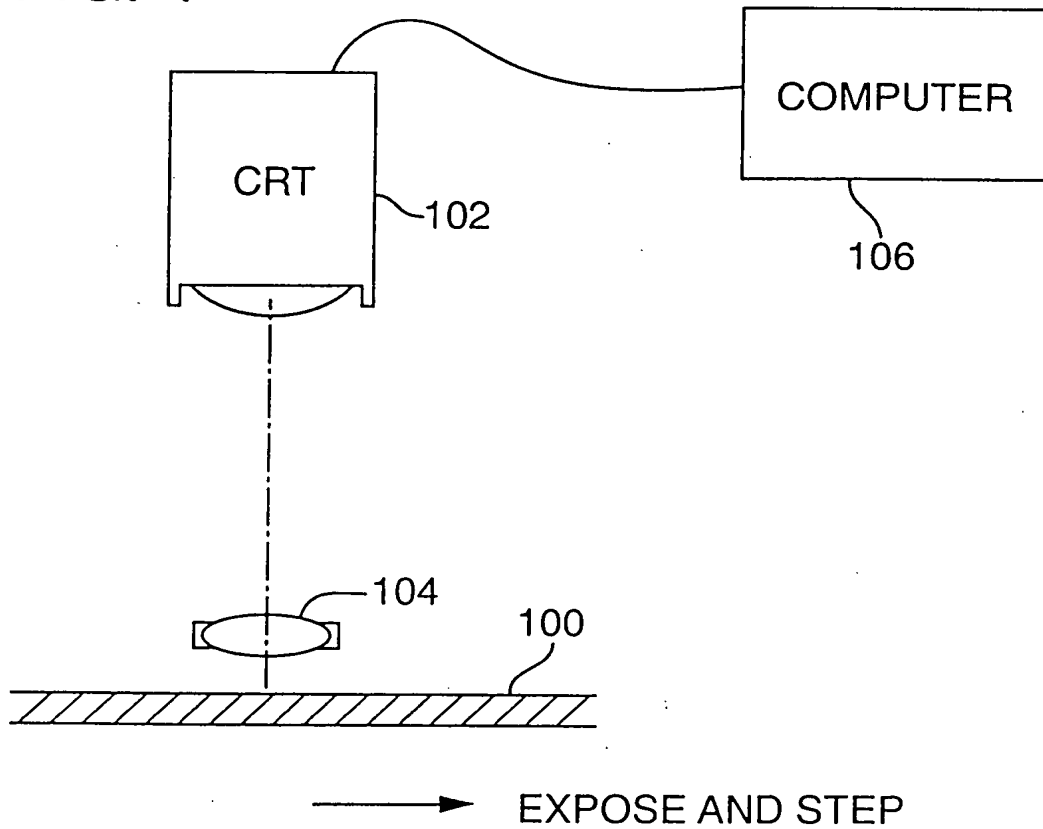


FIG. 1

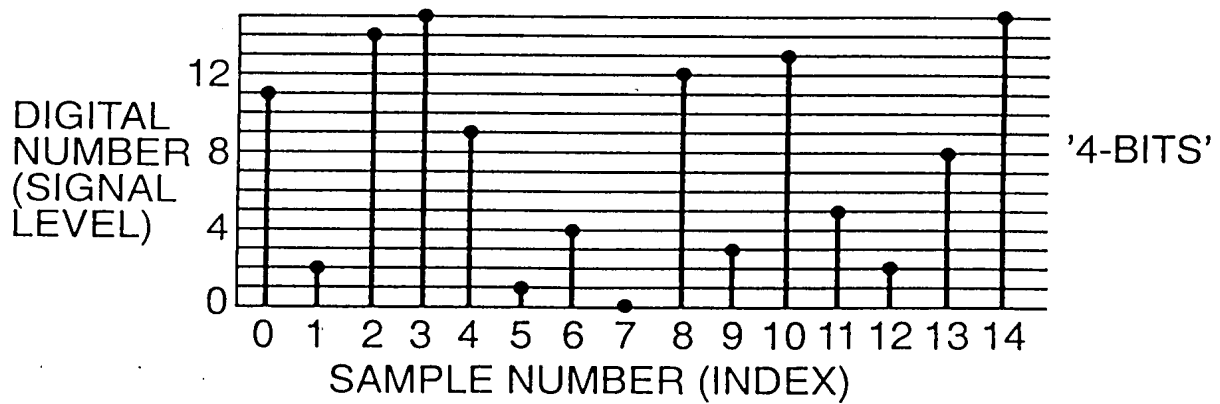


FIG. 2

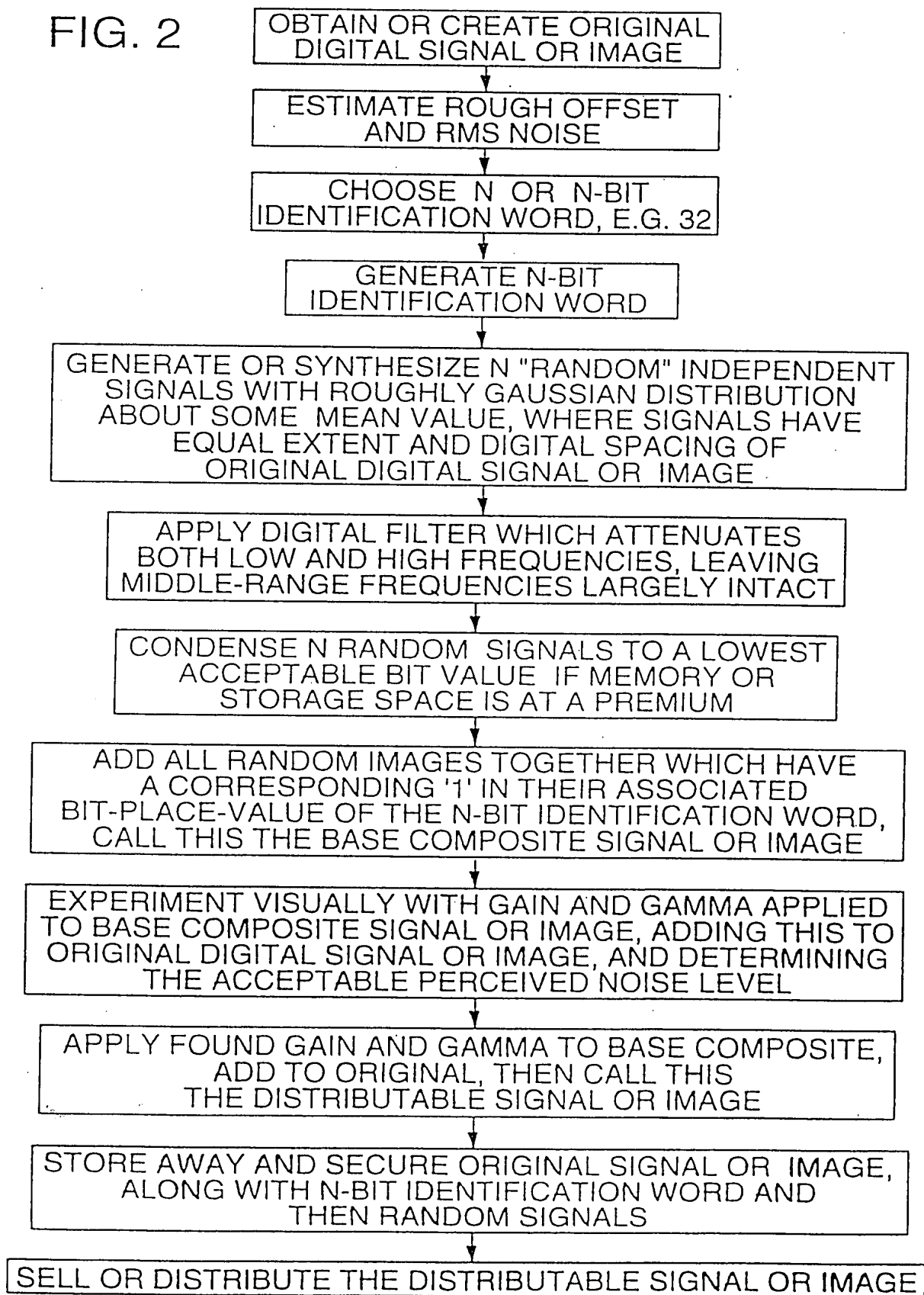


FIG. 3

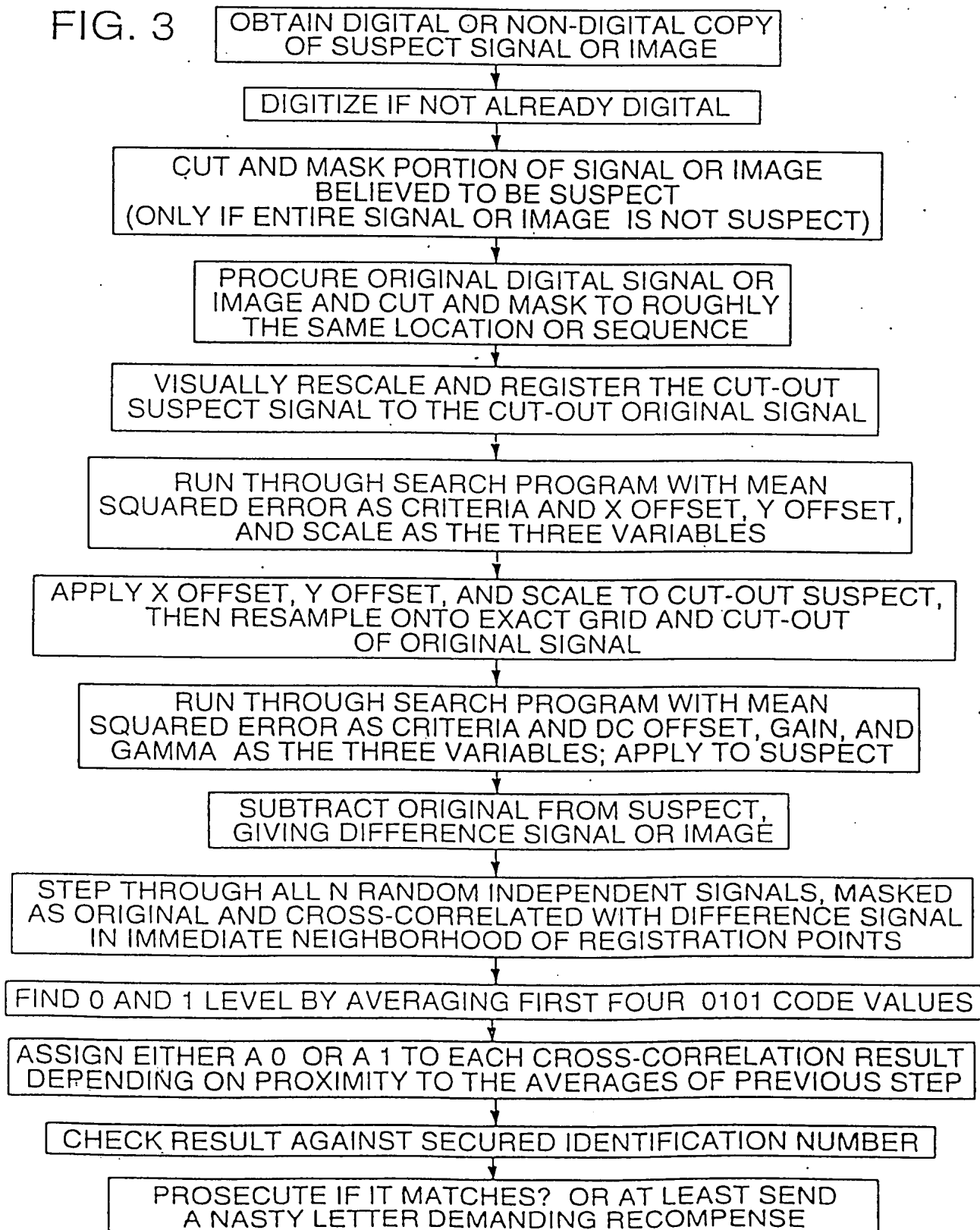


FIG. 5

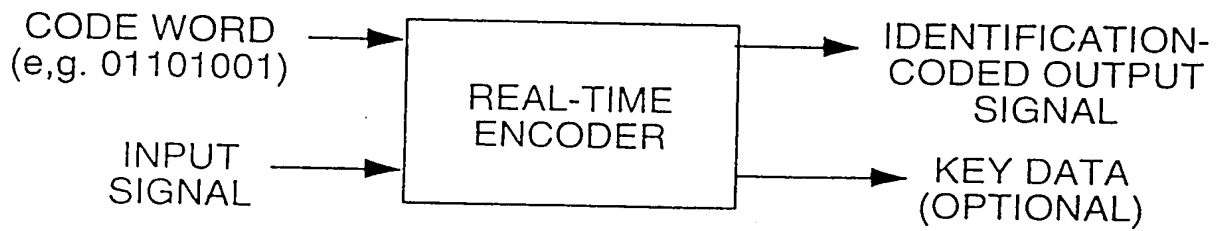
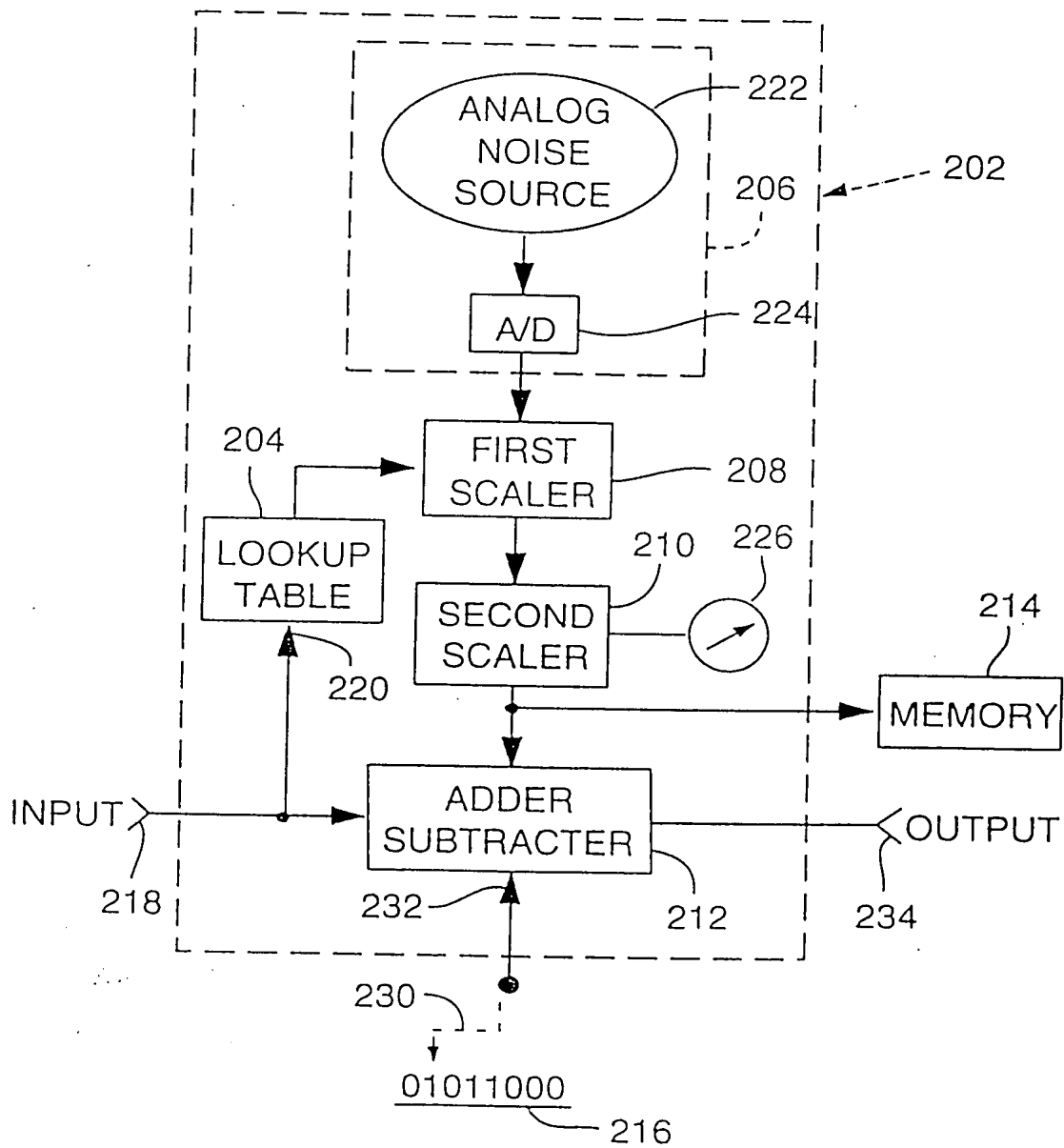


FIG. 6



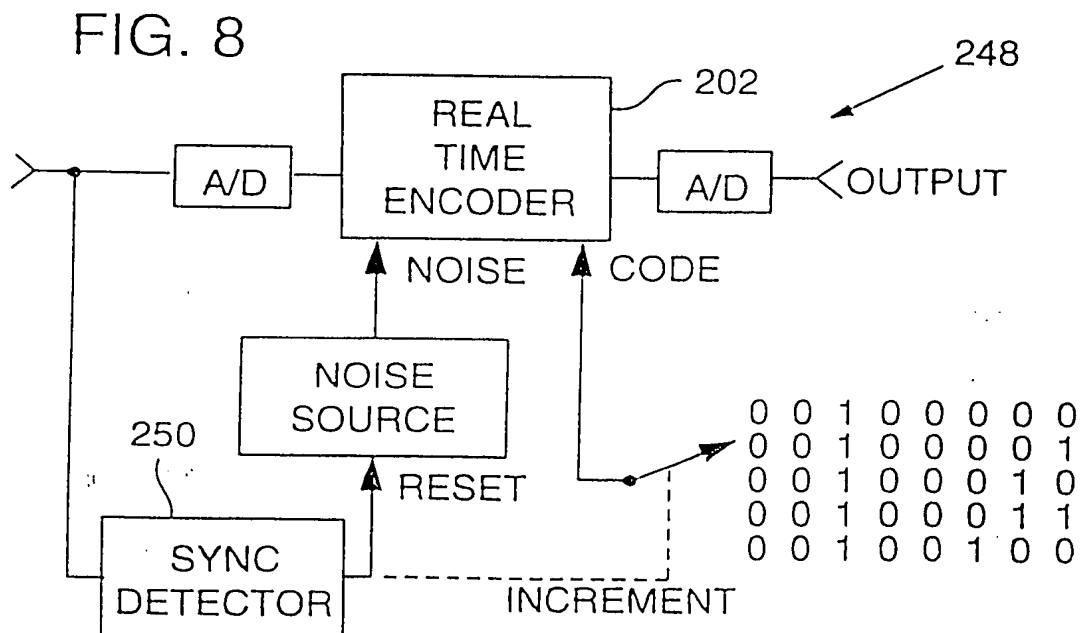
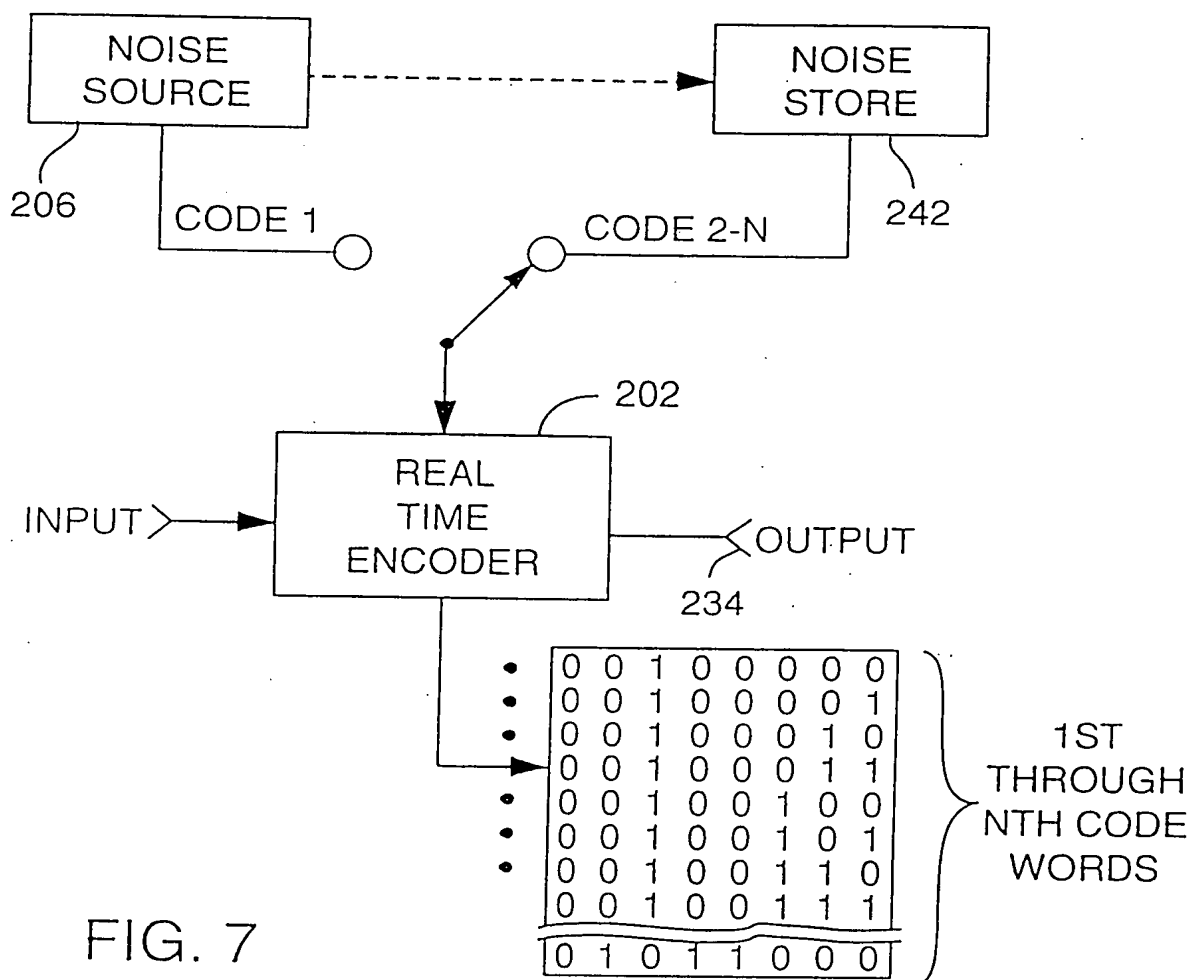


FIG. 9A

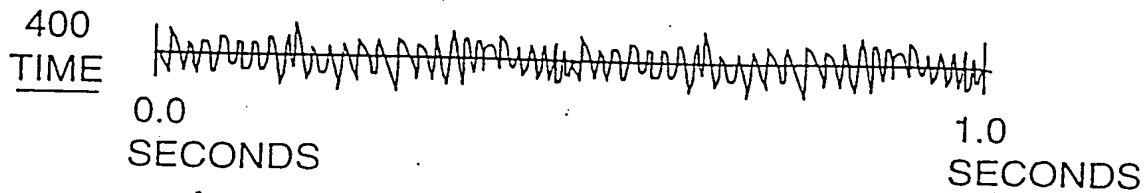


FIG. 9B

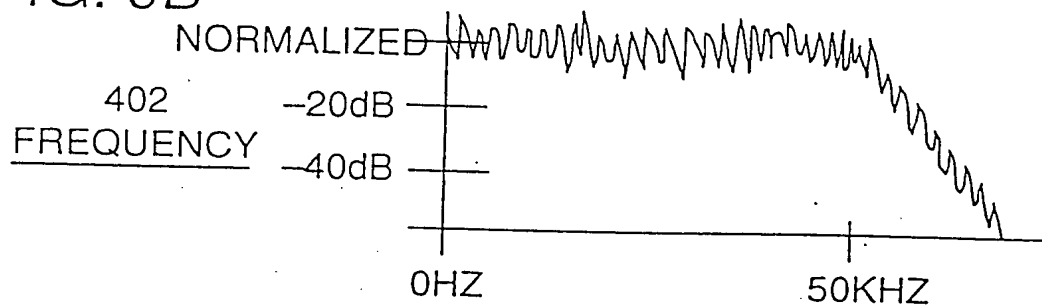


FIG. 9C

BORDER  
CONTINUITY  
404

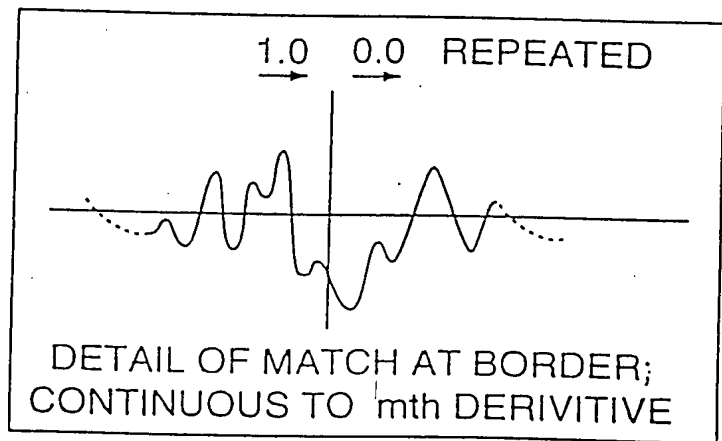


FIG. 10

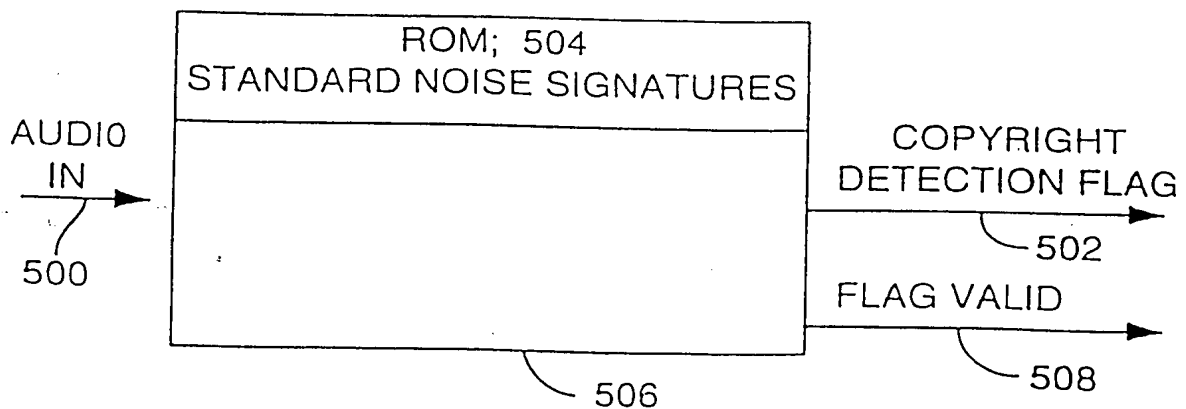


FIG. 11

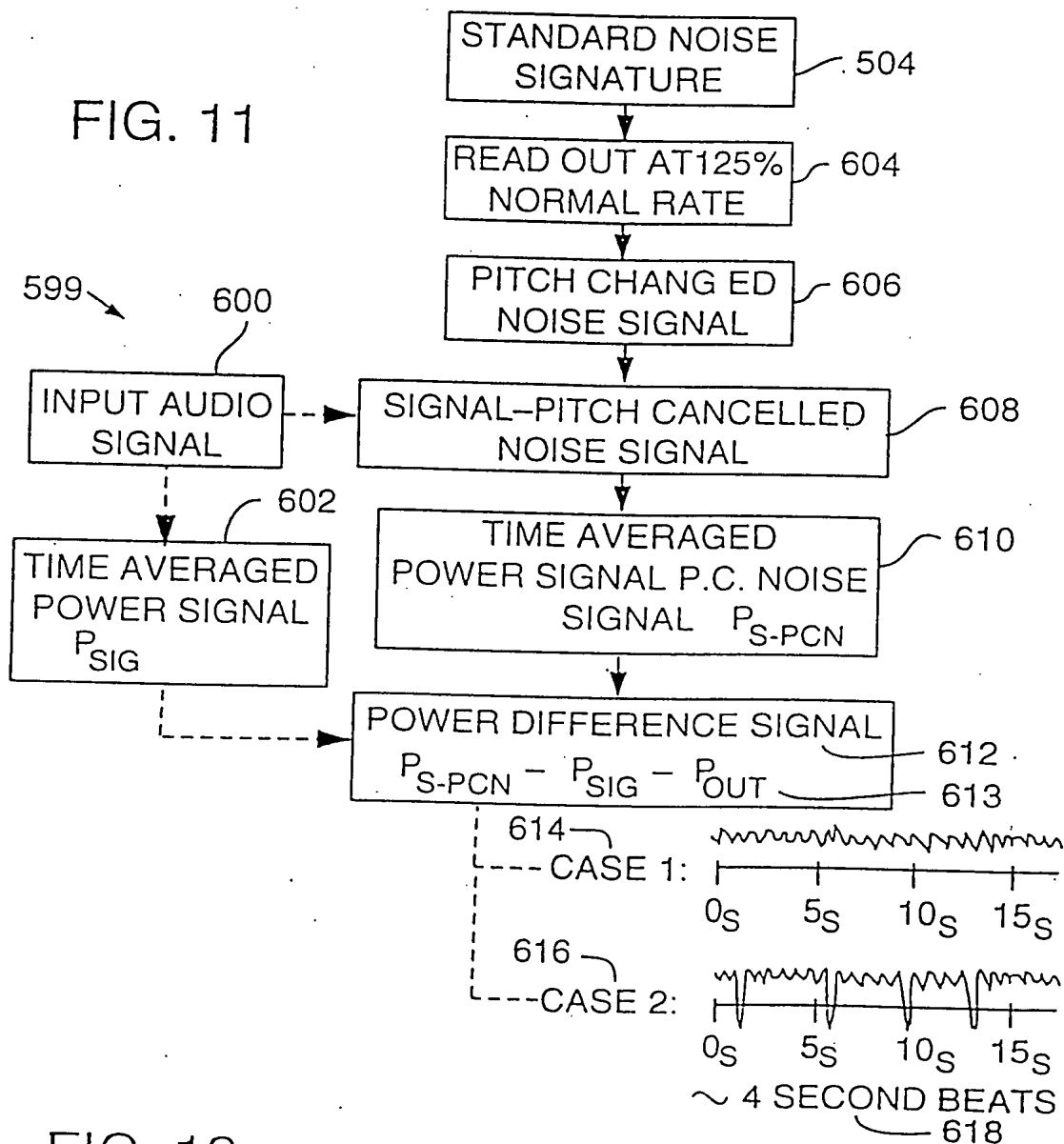


FIG. 12

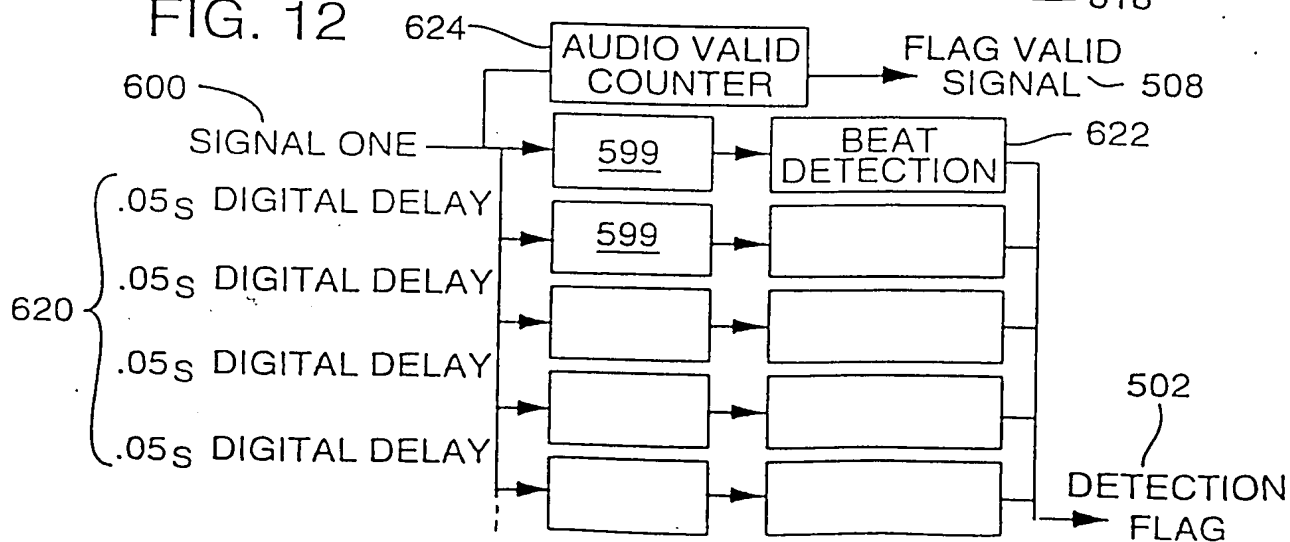
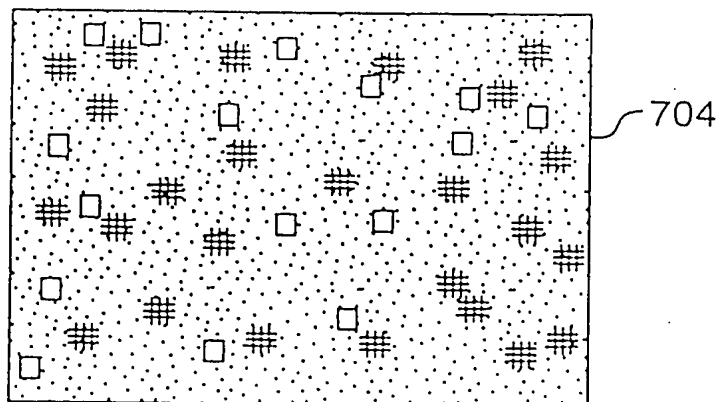
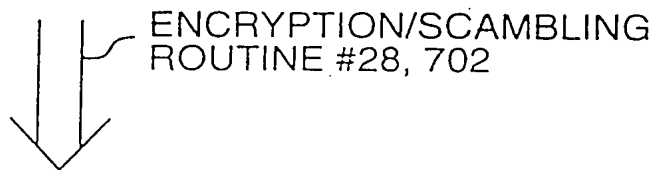
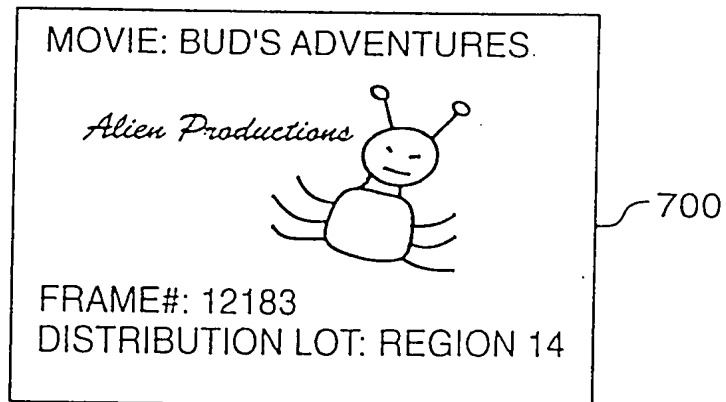


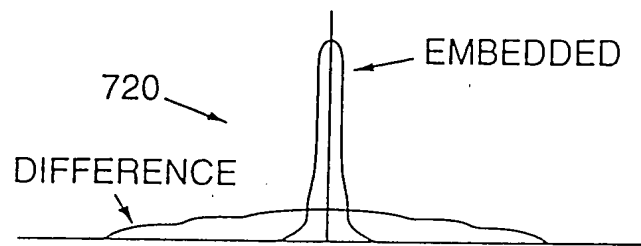
FIG. 13



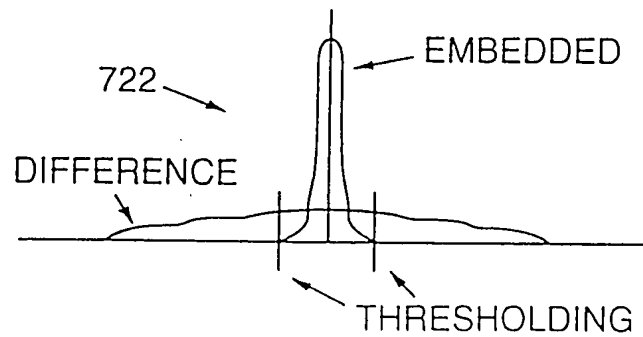
PSEUDO-RANDOM MASTER SNOWY IMAGE  
(SCALED DOWN AND ADDED TO FRAME 12183)



FIG. 14



MEAN-REMOVED HISTOGRAMS OF  
DIFFERENCE SIGNAL AND KNOWN EMBEDDED  
CODE SIGNAL



MEAN-REMOVED HISTOGRAMS OF  
FIRST DERIVATIVES (OR SCALAR GRADIENTS  
IN CASE OF AN IMAGE)

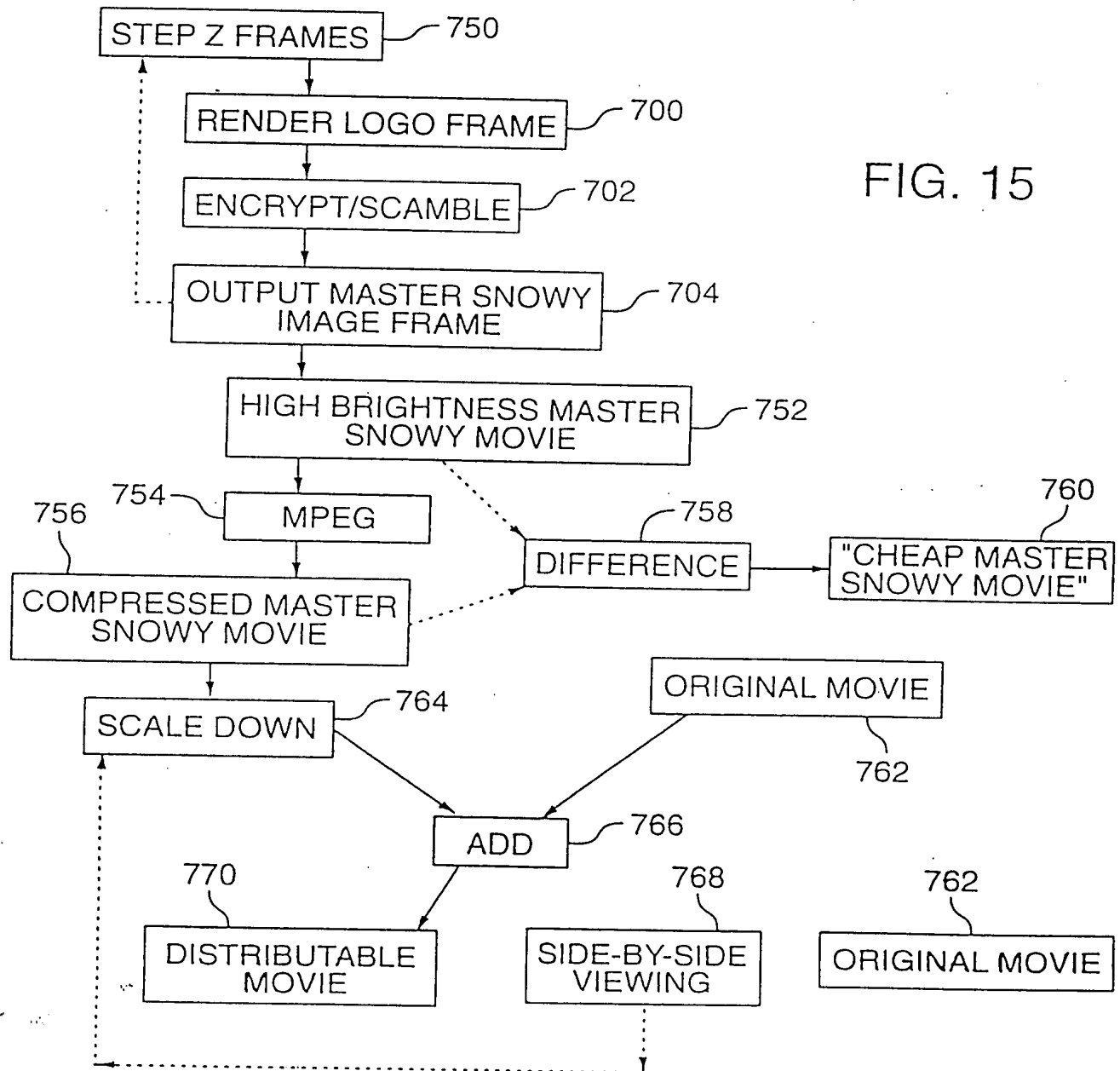


FIG. 15

FIG. 16

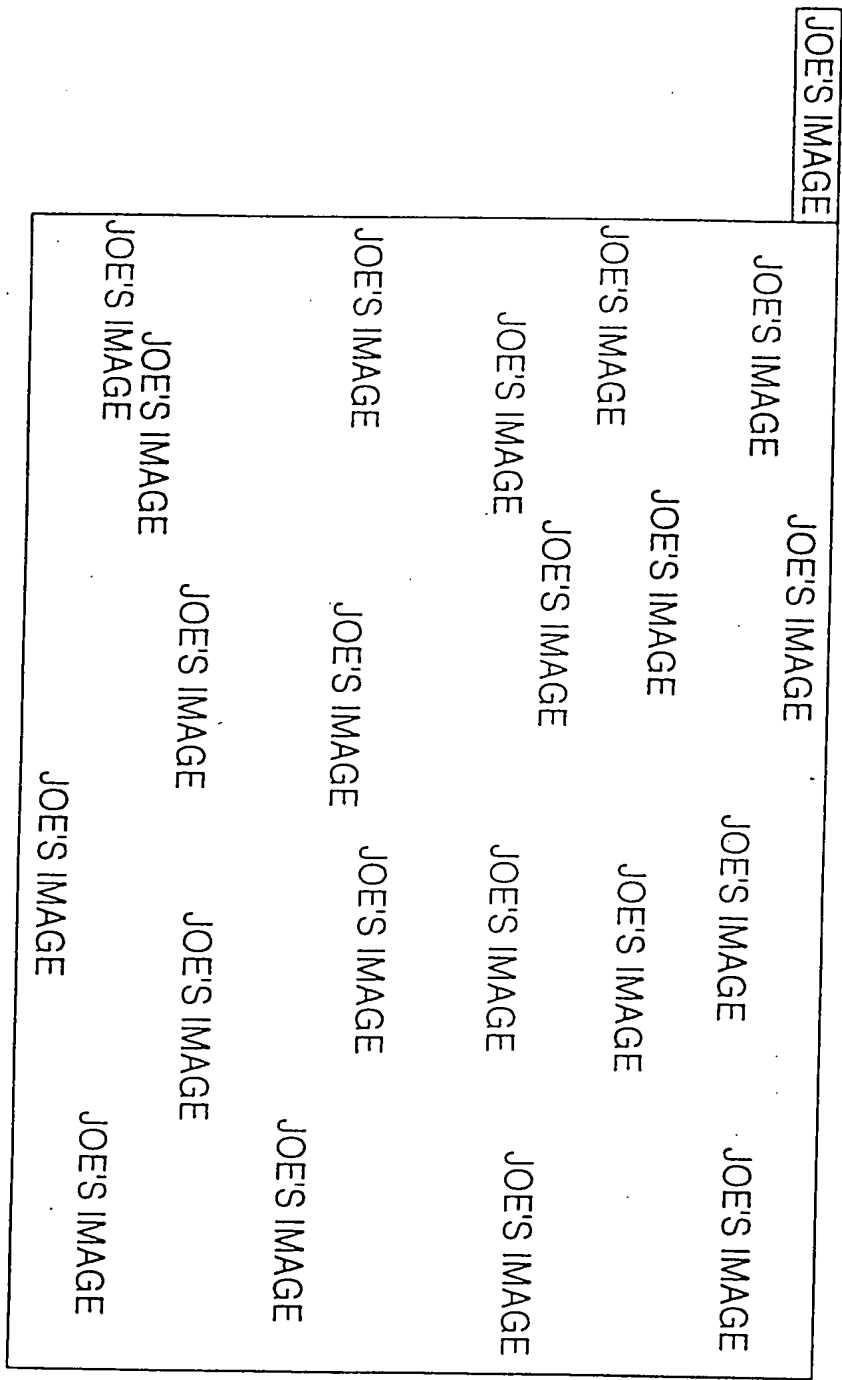
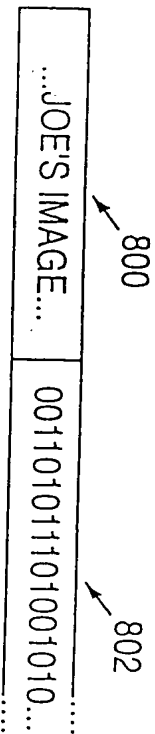


FIG. 17

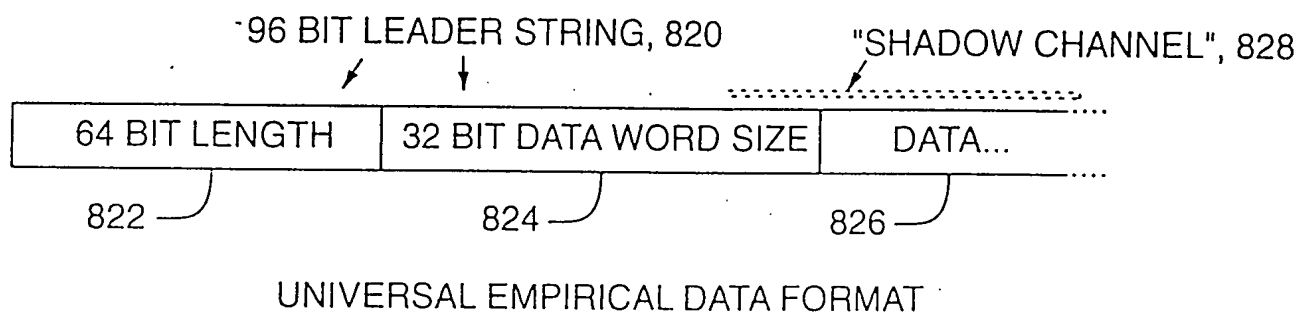


FIG. 18

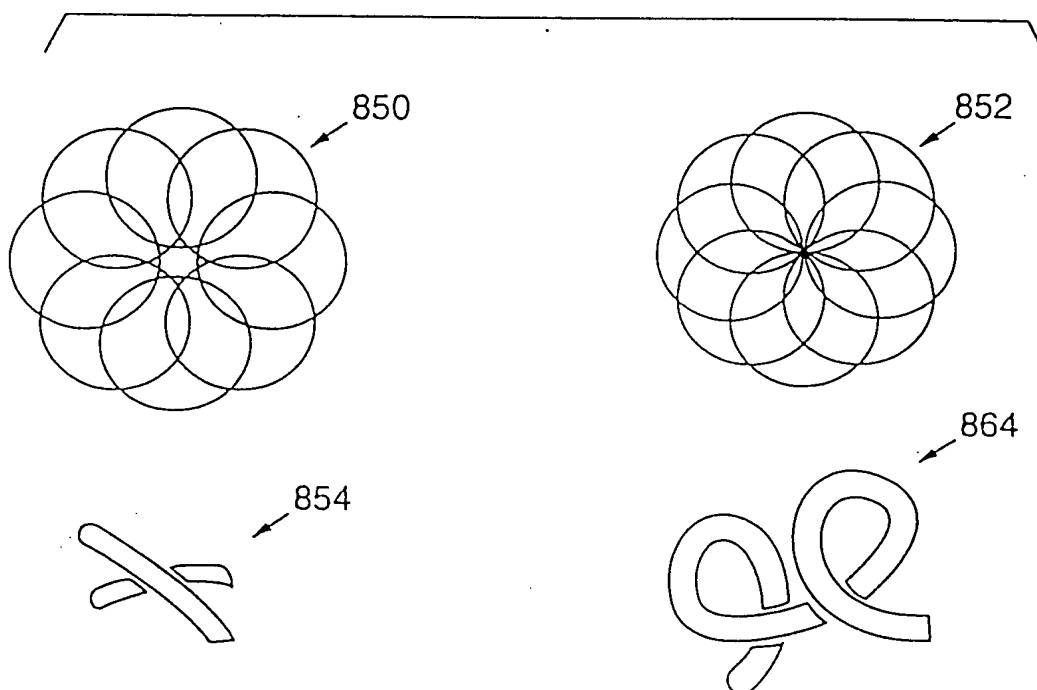
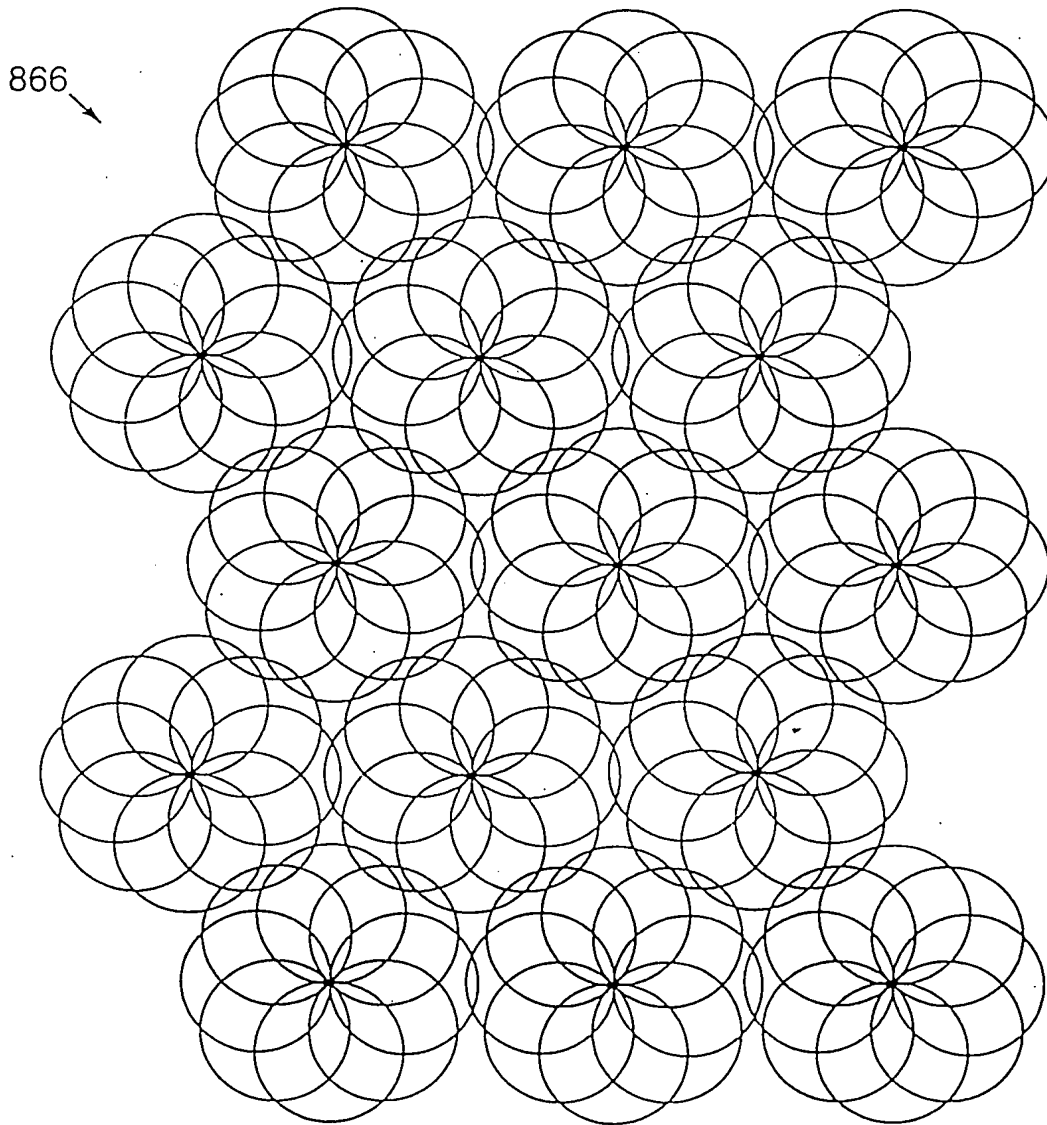


FIG. 19



QUEST. FOR MOSAICED KNOT PATTERNS WHICH "COVER" AND  
ARE COEXTENSIVE WITH ORIGINAL IMAGE;  
ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME  
INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A  
NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 20

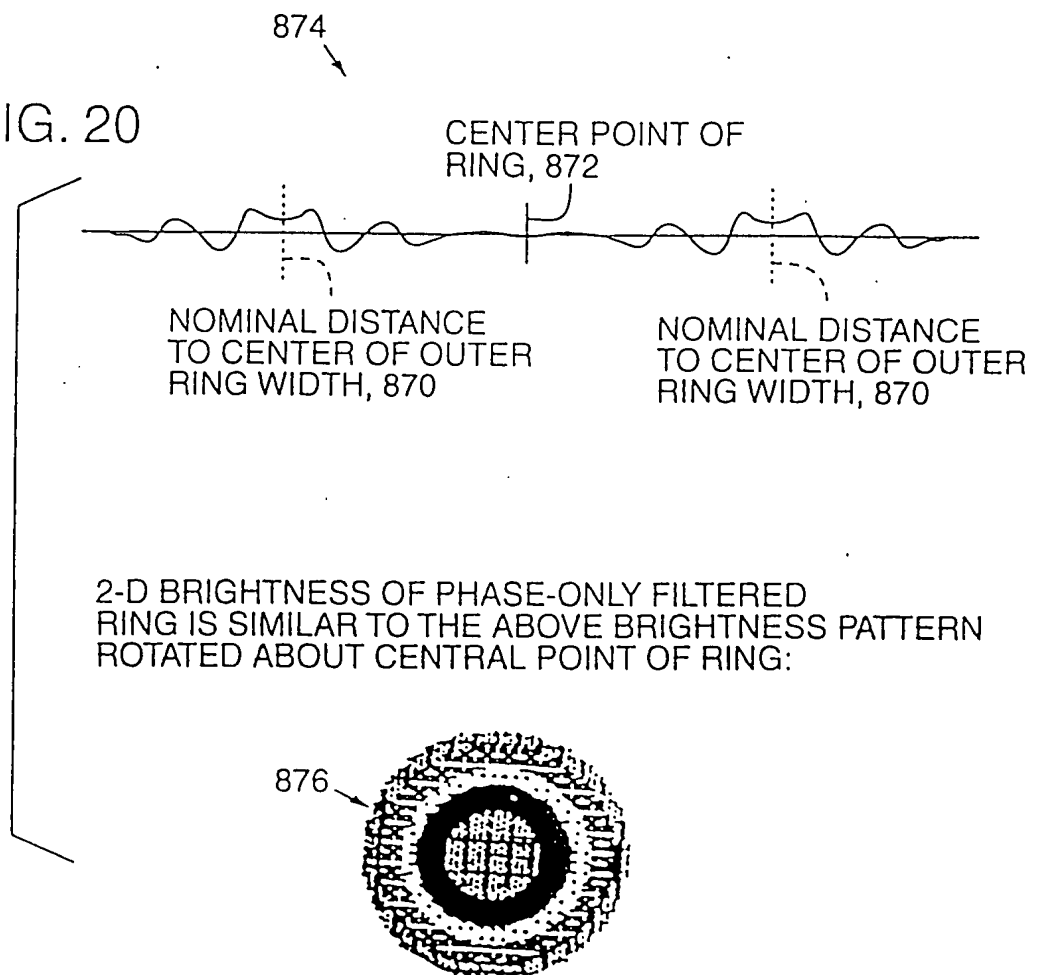


FIG. 21A

900 →

C	2C	C
2C	4C	2C
C	2C	C

WHERE  $C = 1/16$

ELEMENTARY BUMP  
(DEFINED GROUPING OF PIXELS WITH  
WEIGHT VALUES)

FIG. 21B

...	2		3		4		5		6		7		0	...
...														...
...	6		7		0		1		2		3		4	...
...						C	2C	C						...
...	2		3		4	2C	4C	2C	6		7		0	...
...						C	2C	C						...
...	6		7		0		1		2		3		4	...
...														...
...														...

EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS  $N=8$  WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

FIG. 22

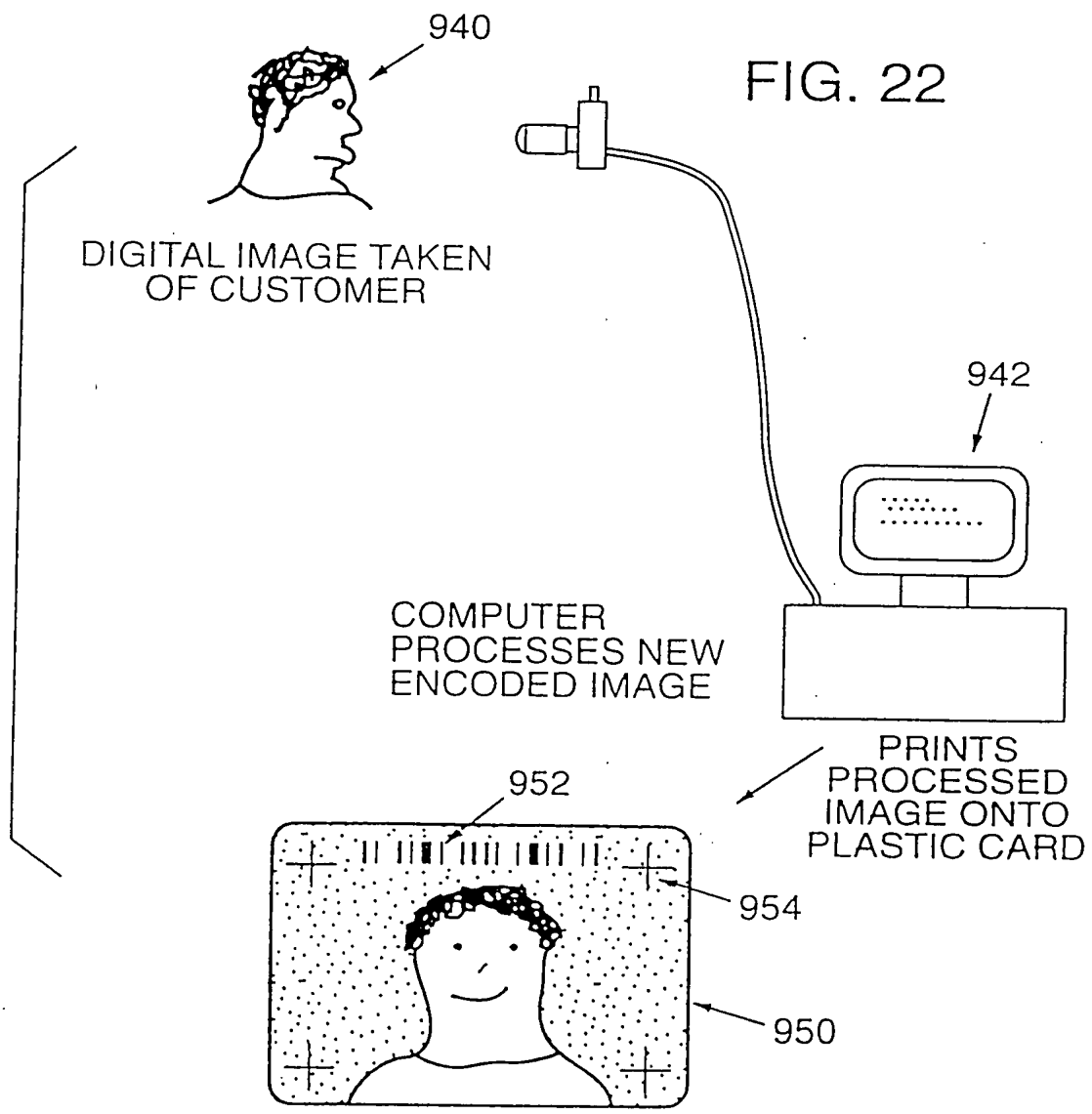
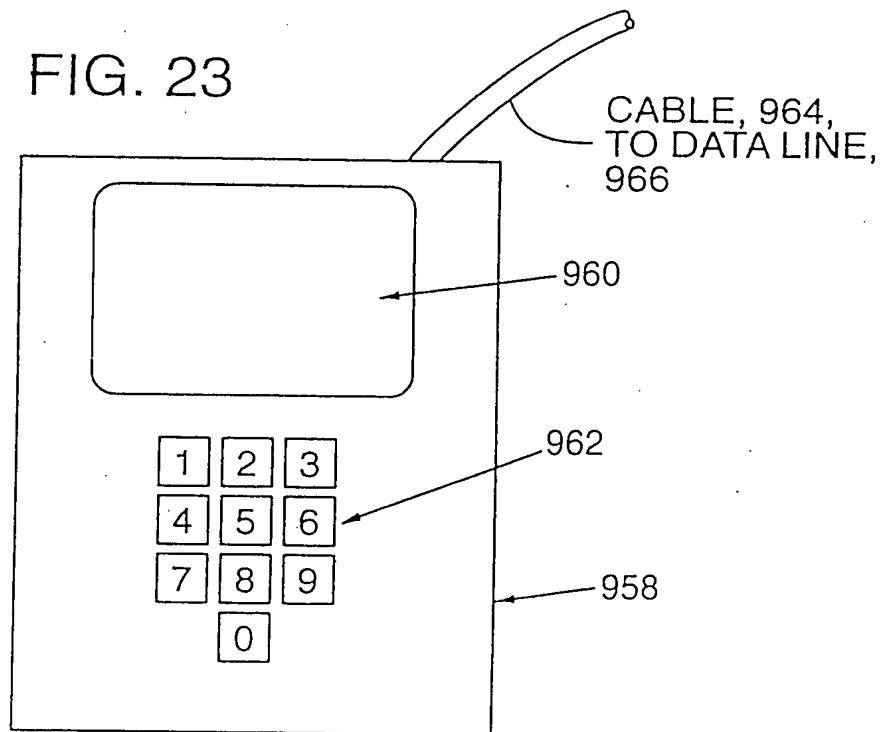




FIG. 23



CONTAINS RUDIMENTARY OPTICAL SCANNER,  
MEMORY BUFFERS, COMMUNICATIONS DEVICES,  
AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW  
AND CAN, AT THEIR PREARRANGED OPTION, EITHER  
TYPE IN A PERSONAL IDENTIFICATION NUMBER  
(PIN, FOR ADDED SECURITY) OR NOT. THE TRANSACTION  
IS APPROVED OR DISAPPROVED WITHIN SECONDS.

FIG. 24

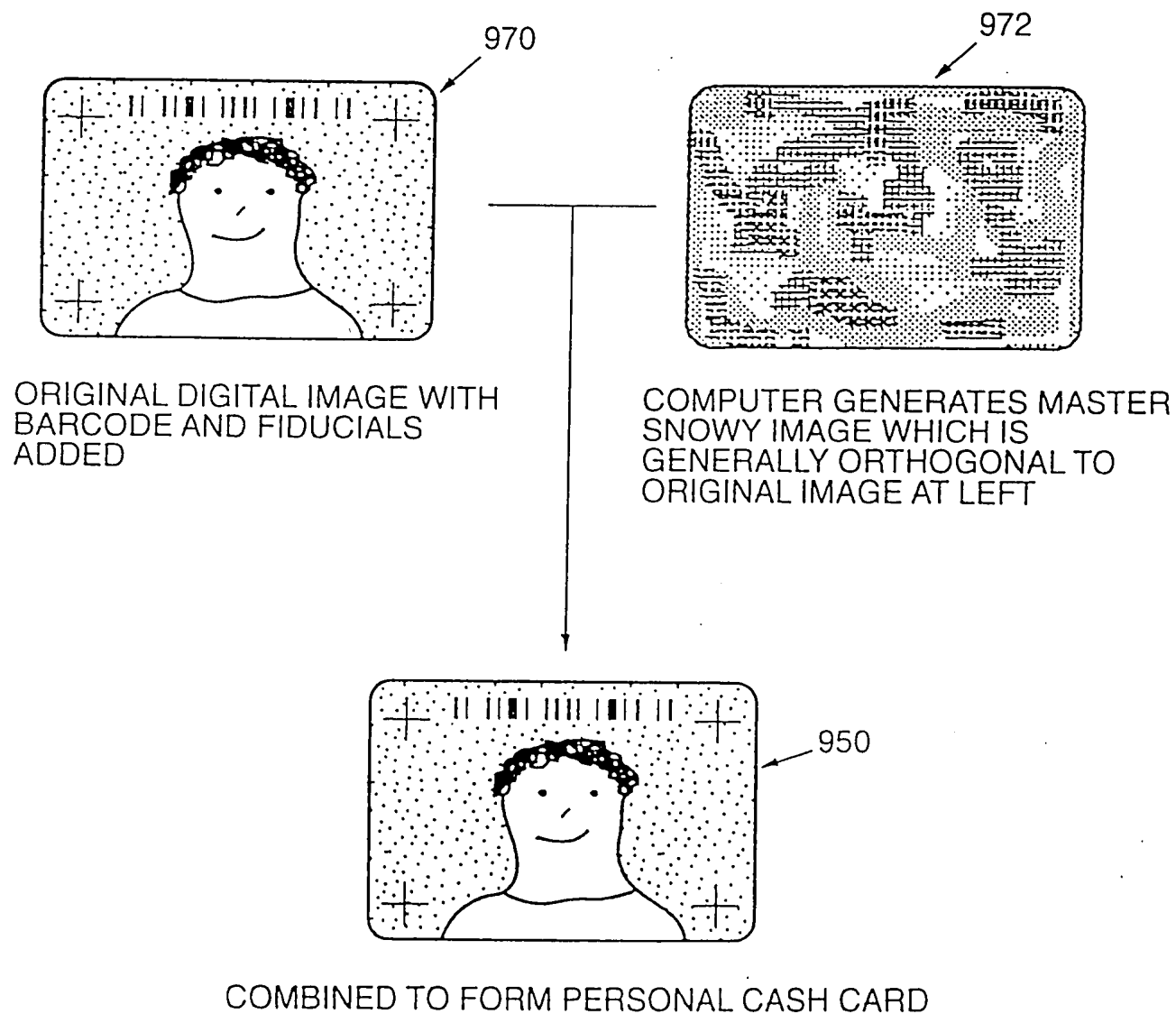
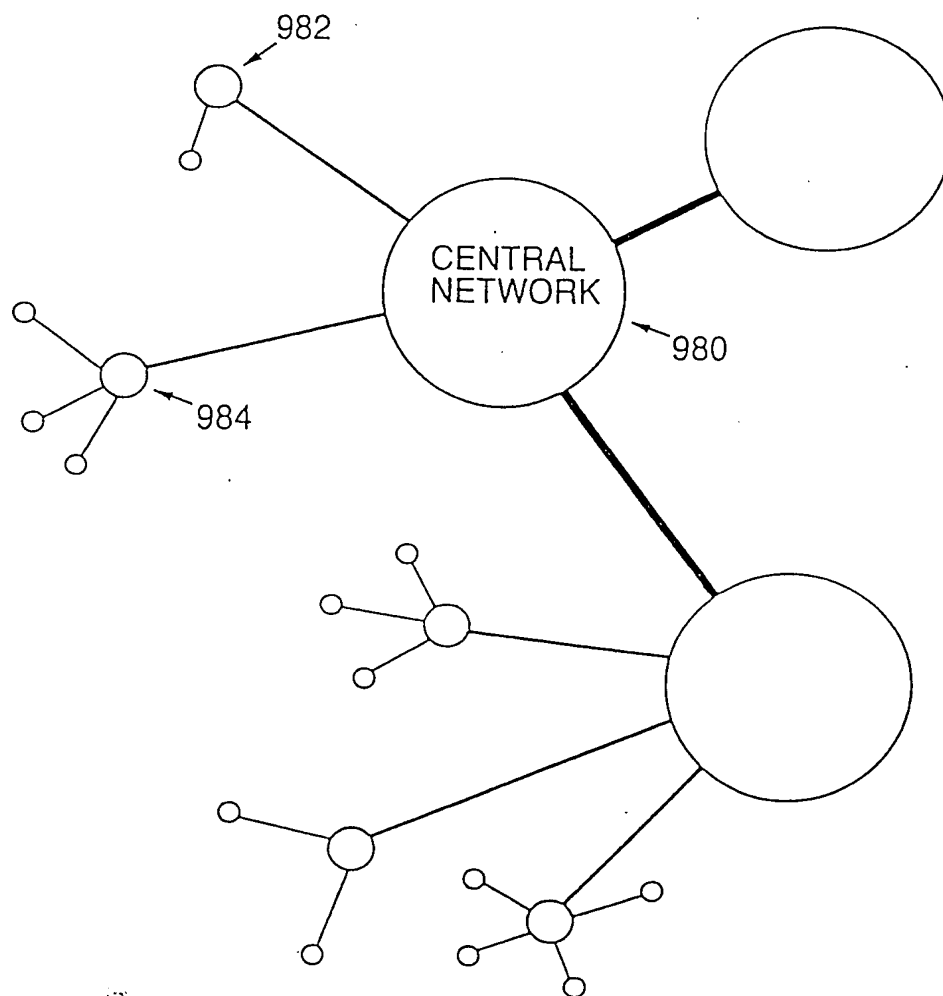


FIG. 25      TYPICAL TRANSACTION STEPS

1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSON'S ID
2. OPTIONAL: USER KEYS IN PIN NUMBER
3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
8. READER STEPS THROUGH THE TWENTY-FOUR SETS
- 8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS
- 8B. READER PERFORMS DOT PRODUCT OF RESULTANT PATTERN AND CARD SCAN, STORES RESULT
9. READER TRANSMITS THE TWENTY-FOUR DOT PRODUCT RESULTS TO CENTRAL NETWORK
10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER
11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 26  
THE NEGLIGIBLE-FRAUD CASH CARD SYSTEM



A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY

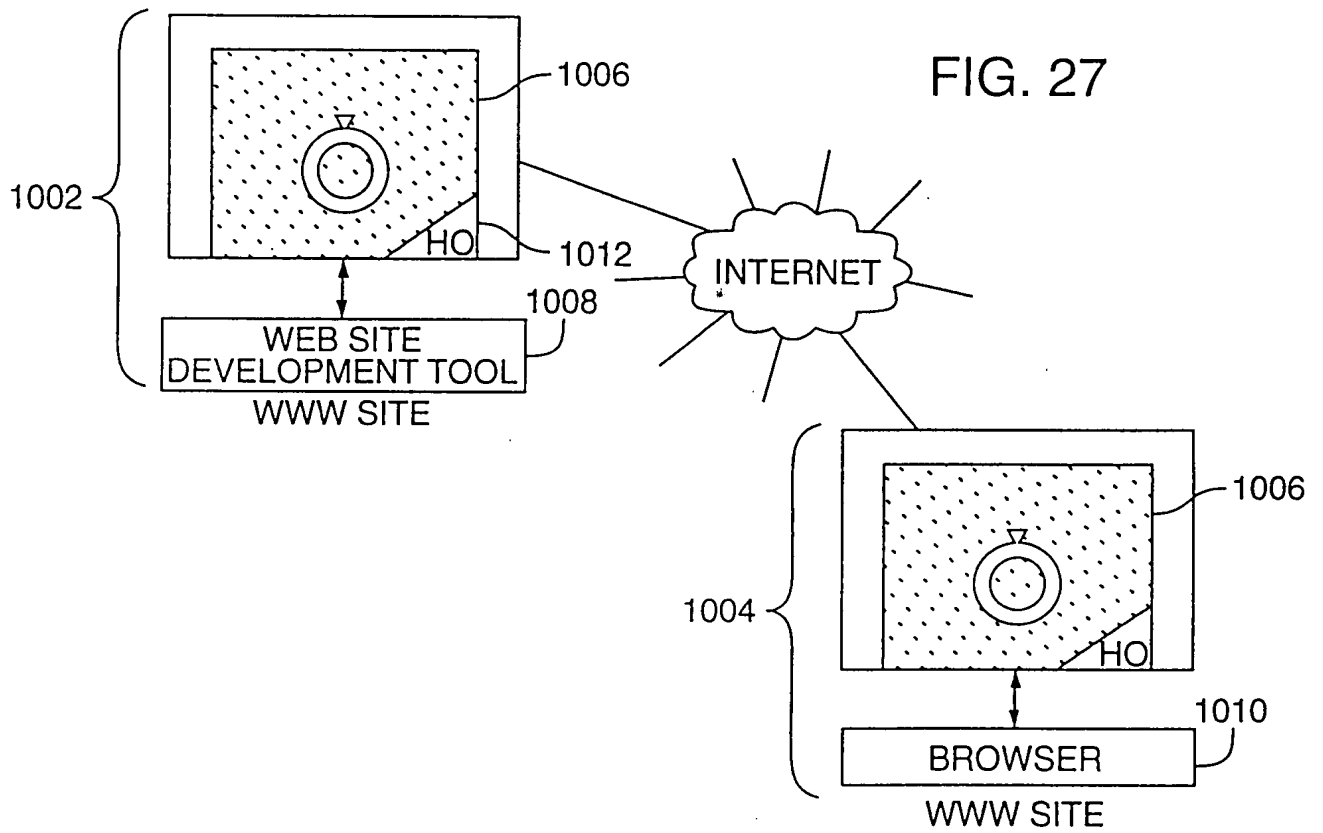


FIG. 28

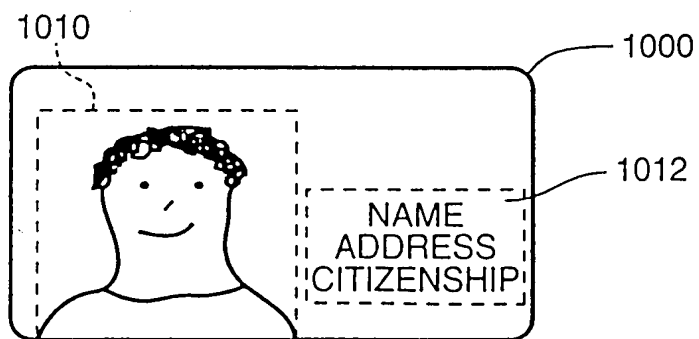


FIG. 27A

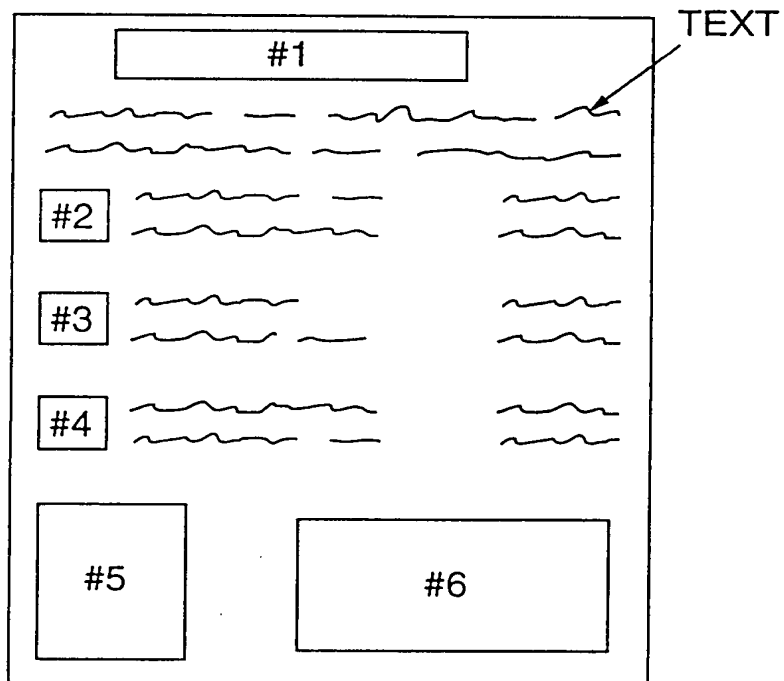


FIG. 27B

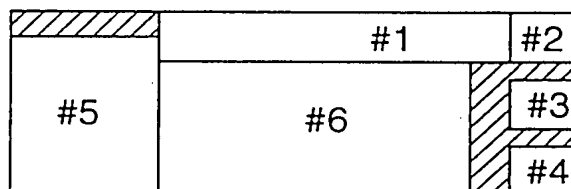
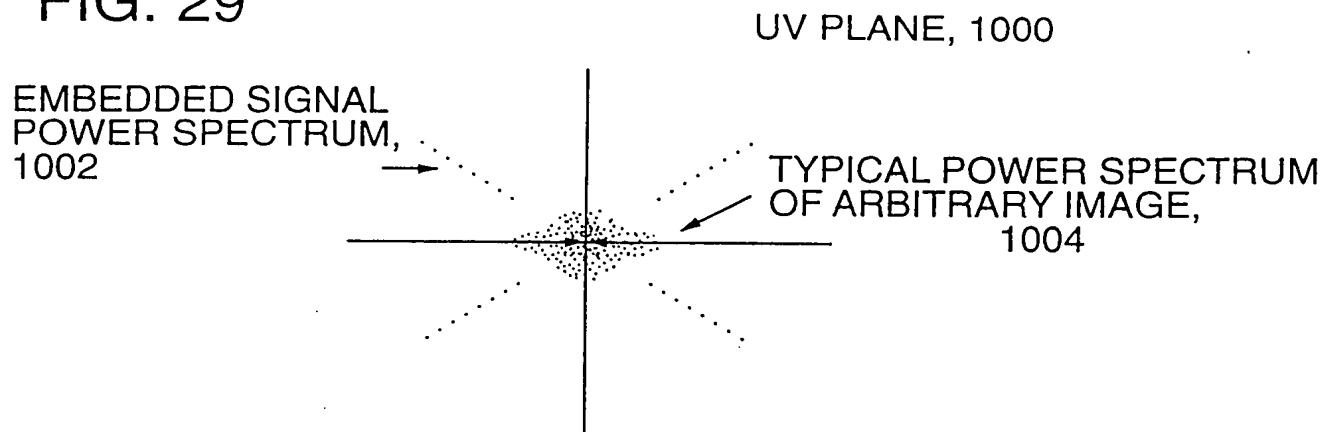
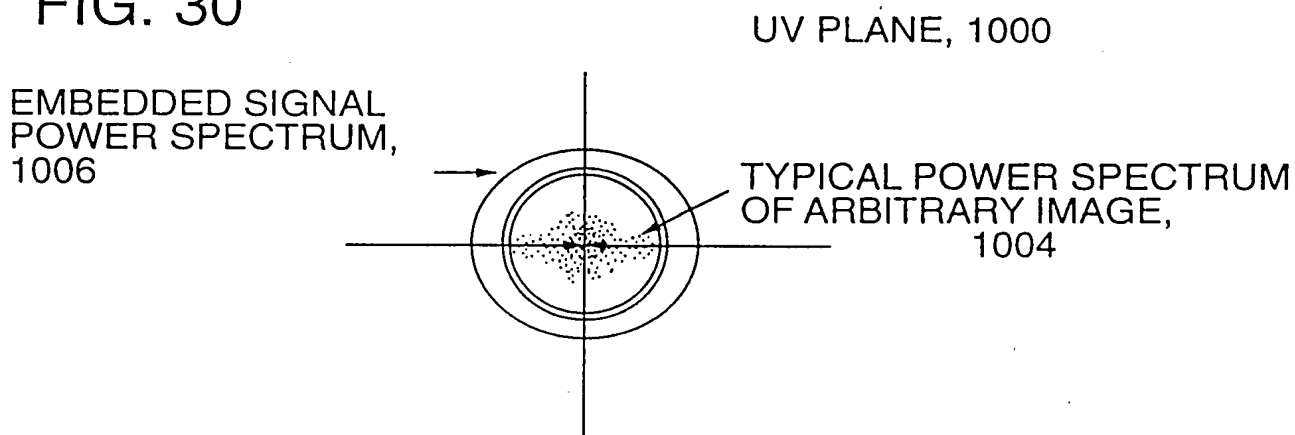


FIG. 29



NON-HARMONIC SPATIAL FREQUENCIES ALONG THE 45 DEGREE AXES, GIVING RISE TO A WEAVE-LIKE CROSS-HATCHING PATTERN IN THE SPATIAL DOMAIN

FIG. 30



NON-HARMONIC CONCENTRIC CIRCLES IN UV PLANE, WHERE PHASE HOPS QUASI-RANDOMLY ALONG EACH CIRCLE, GIVING RISE TO PSEUDO RANDOM LOOKING PATTERNS IN THE SPATIAL DOMAIN

FIG. 29A

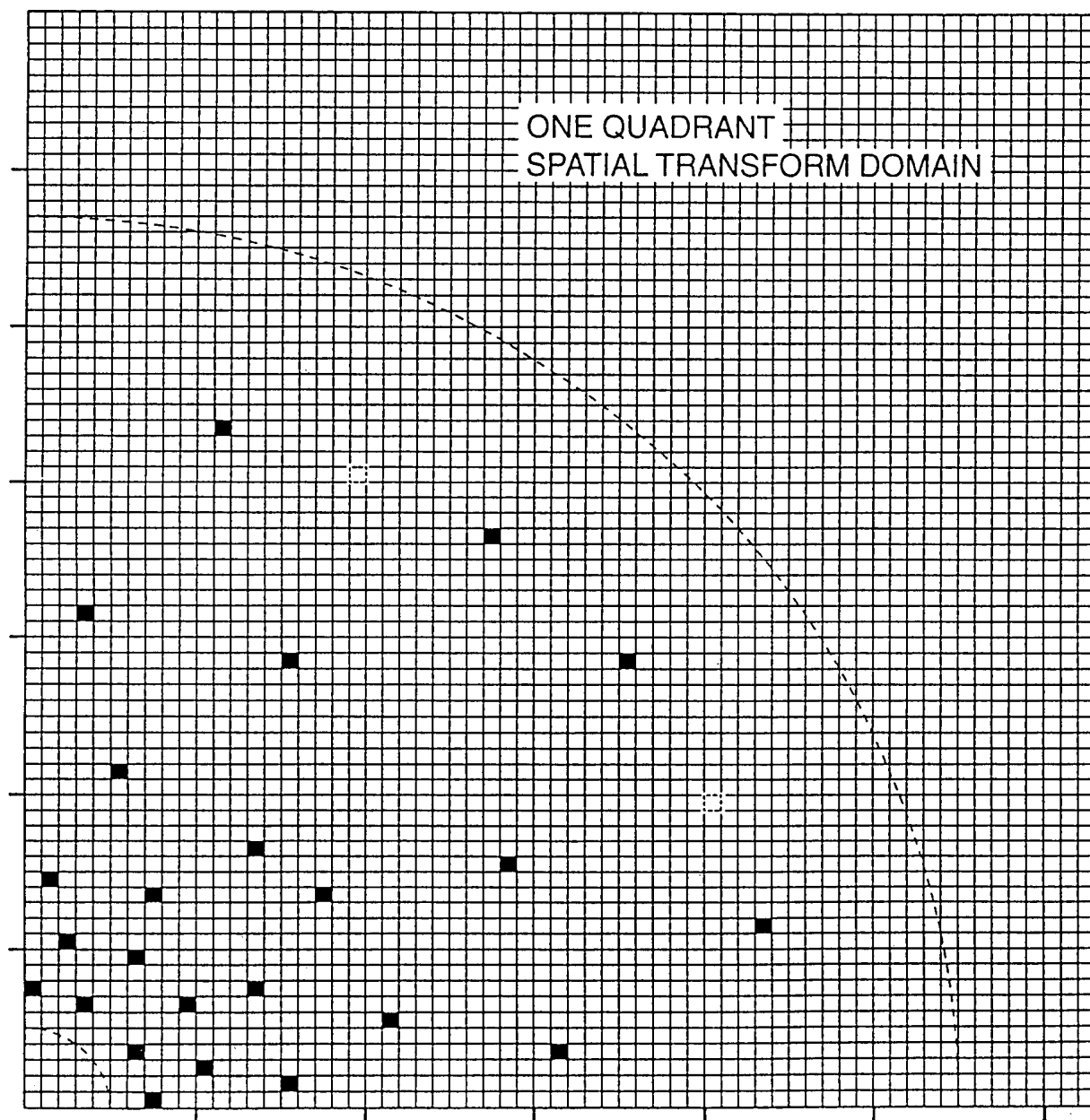
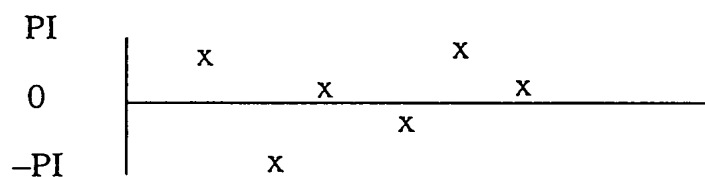


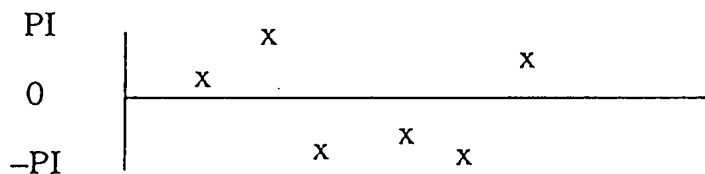


FIG. 31A



PHASE OF SPATIAL  
FREQUENCIES ALONG  
FORWARD 45 DEGREE  
AXES, 1008

FIG. 31B



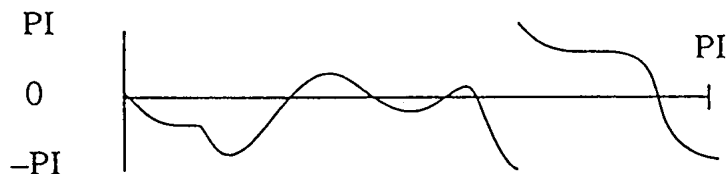
PHASE OF SPATIAL  
FREQUENCIES ALONG  
BACKWARD 45 DEGREE  
AXES, 1010

FIG. 32A



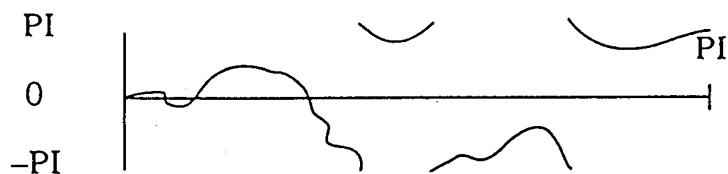
PHASE OF SPATIAL  
FREQUENCIES ALONG  
FIRST CONCENTRIC RING,  
1012

FIG. 32B



PHASE OF SPATIAL  
FREQUENCIES ALONG  
SECOND CONCENTRIC RING,  
1014

FIG. 32C



PHASE OF SPATIAL  
FREQUENCIES ALONG  
THIRD CONCENTRIC RING,  
1016

FIG. 33A

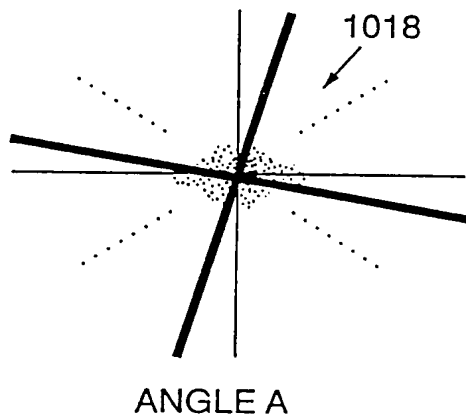


FIG. 33B

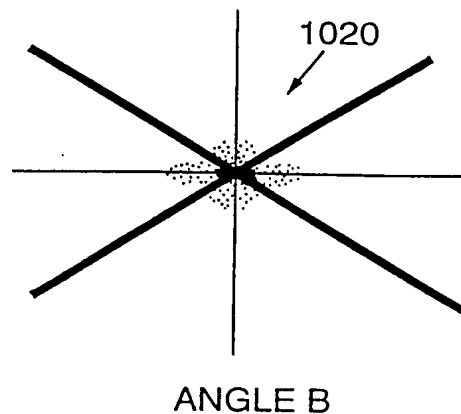
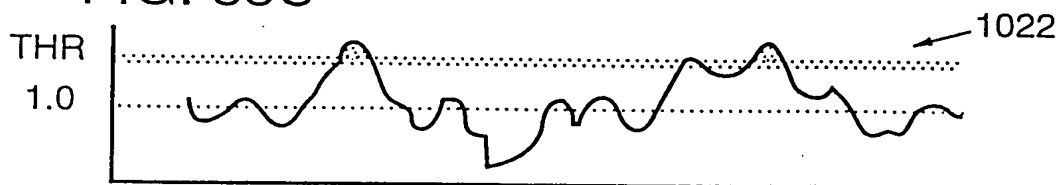
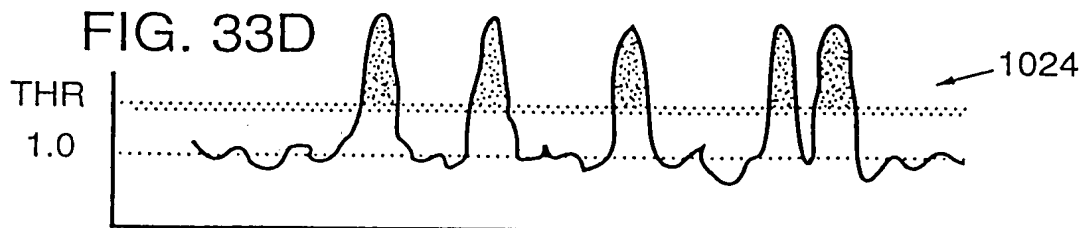


FIG. 33C



POWER PROFILE ALONG ANGLE A, AS NORMALIZED BY ITS OWN MOVING AVERAGE; ONLY A MINIMAL AMOUNT EXCEEDS THRESHOLD, GIVING A SMALL INTEGRATED VALUE

FIG. 33D



POWER PROFILE ALONG ANGLE B, AS NORMALIZED BY ITS OWN MOVING AVERAGE; THIS FINDS STRONG ENERGY ABOVE THE THRESHOLD

FIG. 33E

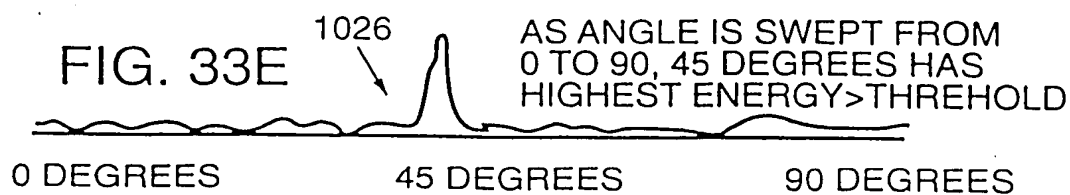


FIG. 34A

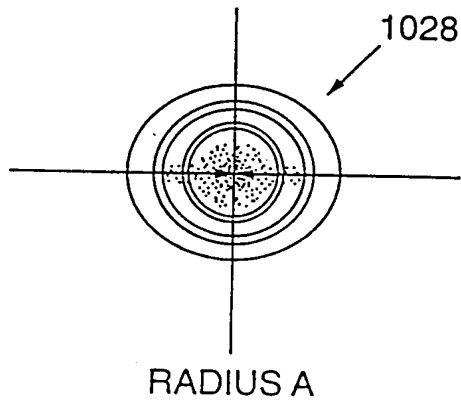


FIG. 34B

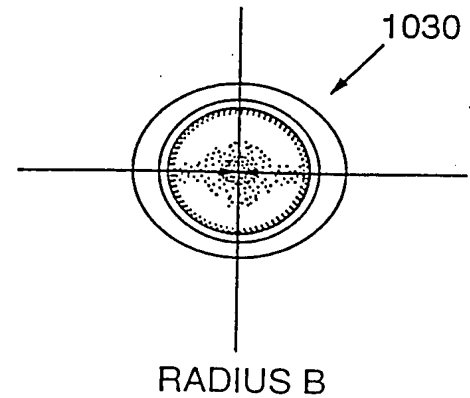


FIG. 34C

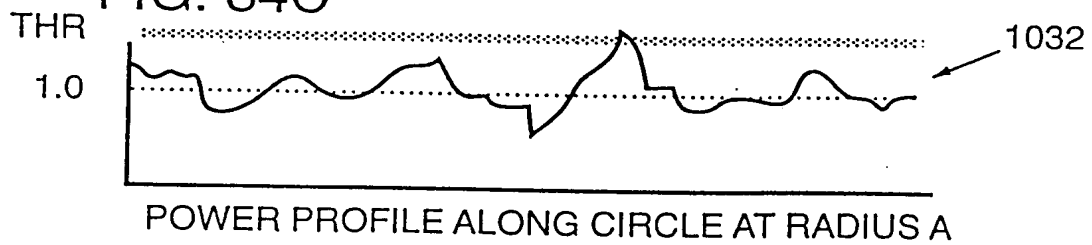


FIG. 34D

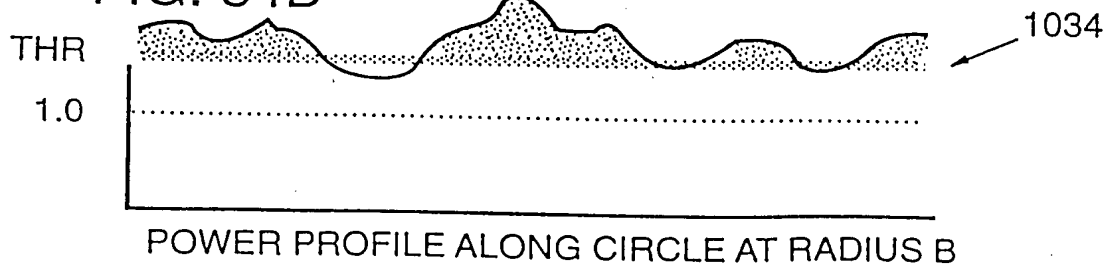


FIG. 34E

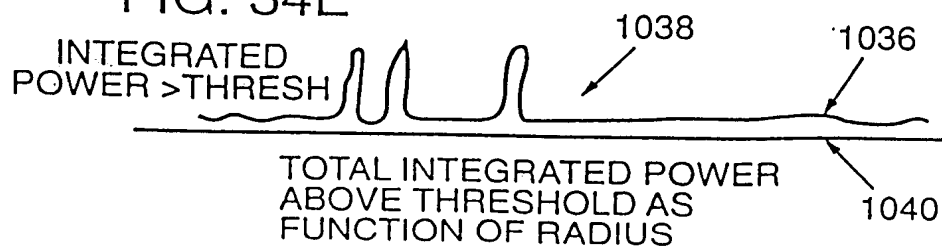
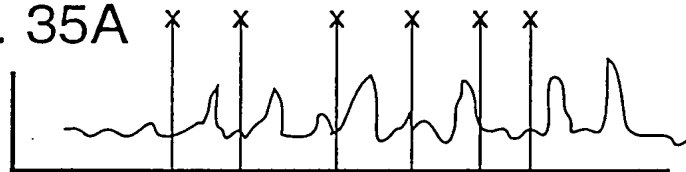
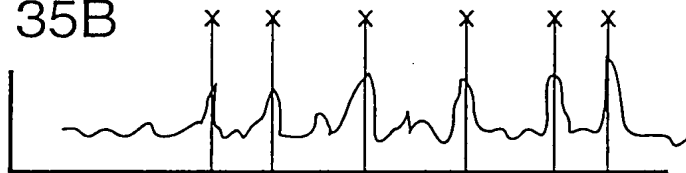


FIG. 35A



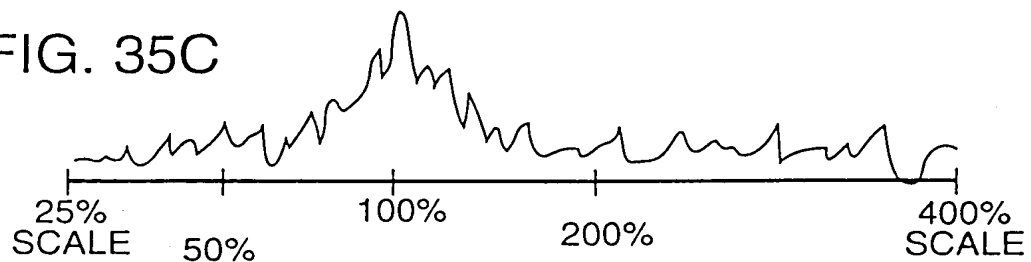
SCALE = A; ADD ALL POWER VALUES AT THE  
"KNOWN" FREQUENCIES", 1042

FIG. 35B



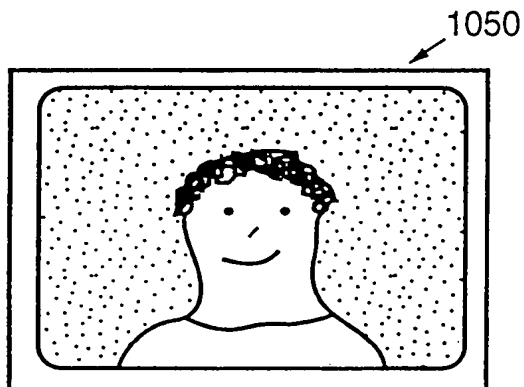
SCALE = B; ADD ALL POWER VALUES AT THE  
"KNOWN" FREQUENCIES", 1044

FIG. 35C



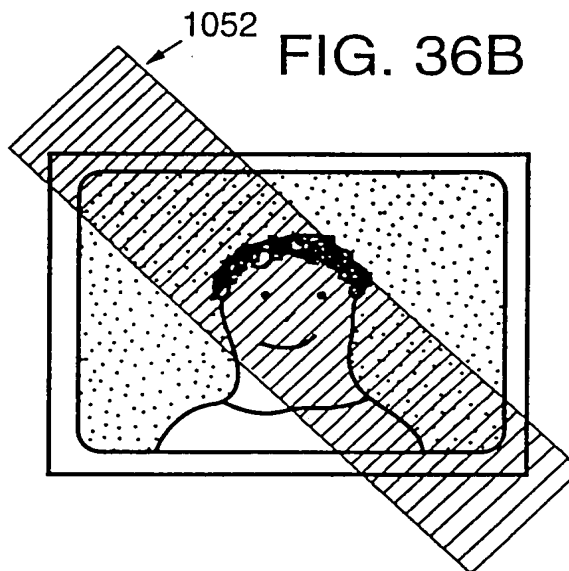
"SCALED-KERNEL" BASED MATCHED FILTER; PEAK IS  
WHERE THE SCALE OF THE SUBLIMINAL GRID WAS  
FOUND, 1046

FIG. 36A



ARBITRARY ORIGINAL IMAGE  
IN WHICH SUBLIMINAL  
GRATICULES MAY HAVE BEEN PLACED

FIG. 36B



"COLUMN SCAN"  
IS APPLIED ALONG A  
GIVEN ANGLE THROUGH  
THE CENTER OF THE  
IMAGE

COLUMN-  
INTEGRATED  
GREY  
VALUES,  
1054

FIG. 36C

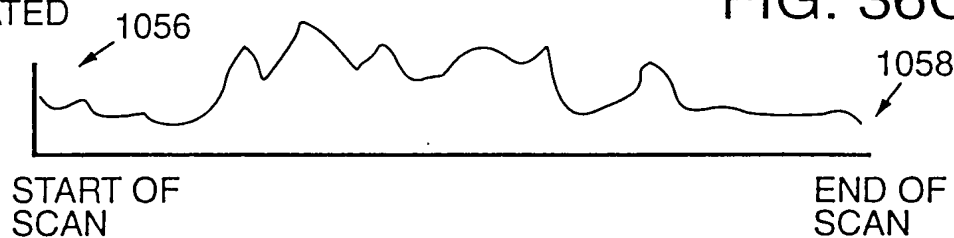
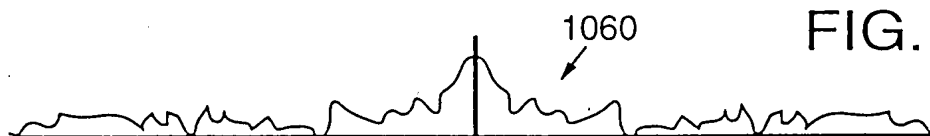


FIG. 36D



MAGNITUDE OF FOURIER TRANSFORM OF SCAN DATA

## FIG. 37

### PROCESS STEPS

1. SCAN IN PHOTOGRAPH
2. 2D FFT
3. GENERATE 2D POWER SPECTRUM, FILTER WITH E.G. 3X3 BLURRING KERNEL
4. STEP ANGLES FROM 0 DEGREES THROUGH 90 (1/2 DEG)
5. GENERATE NORMALIZED VECTOR, WITH POWER VALUE AS NUMERATOR, AND MOVING AVERAGED POWER VALUE AS DENOMINATOR
6. INTEGRATE VALUES AS SOME THRESHOLD, GIVING A SINGLE INTEGRATED VALUE FOR THIS ANGLE
7. END STEP ON ANGLES
8. FIND TOP ONE OR TWO OR THREE "PEAKS" FROM THE ANGLES IN LOOP 4, THEN FOR EACH PEAK...
9. STEP SCALE FROM 25% TO 400%, STEP ~1.01
10. ADD THE NORMALIZED POWER VALUES CORRESPONDING TO THE 'N' SCALED FREQUENCIES OF STANDARD
11. KEEP TRACK OF HIGHEST VALUE IN LOOP
12. END LOOP 9 AND 8, DETERMINE HIGHEST VALUE
13. ROTATION AND SCALE NOW FOUND
14. PERFORM TRADITIONAL MATCHED FILTER TO FIND EXACT SPATIAL OFFSET
15. PERFORM ANY "FINE TUNING" TO PRECISELY DETERMINE ROTATION, SCALE, OFFSET

FIG. 38

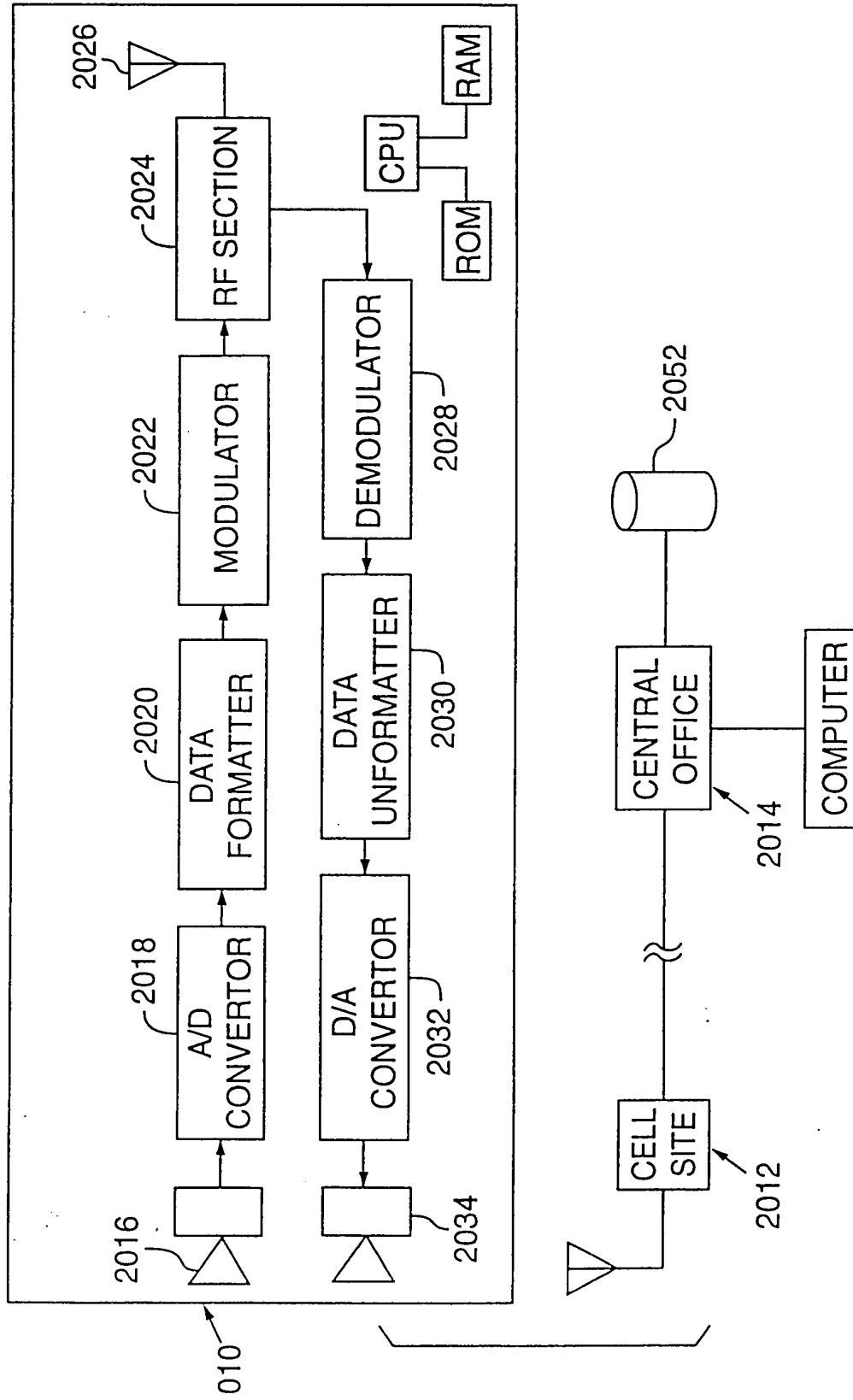
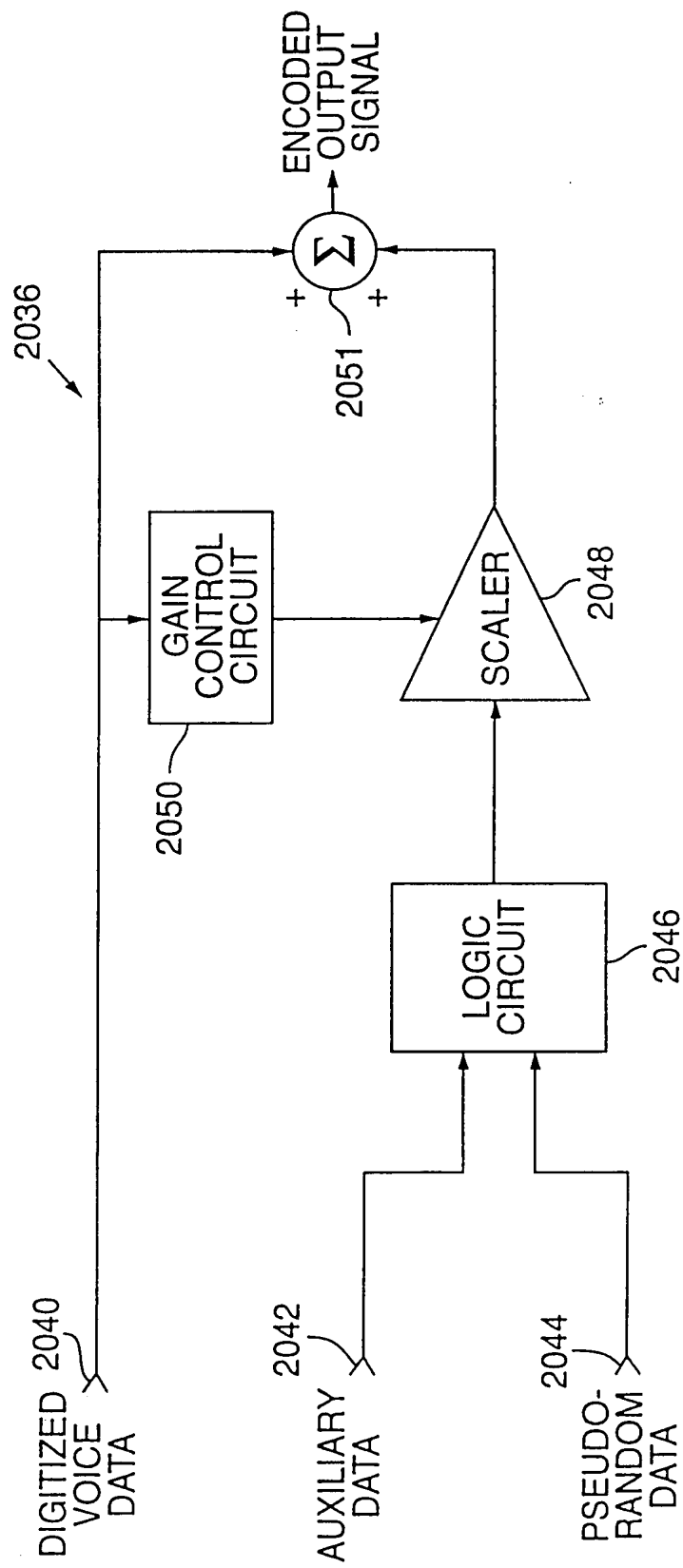


FIG. 39





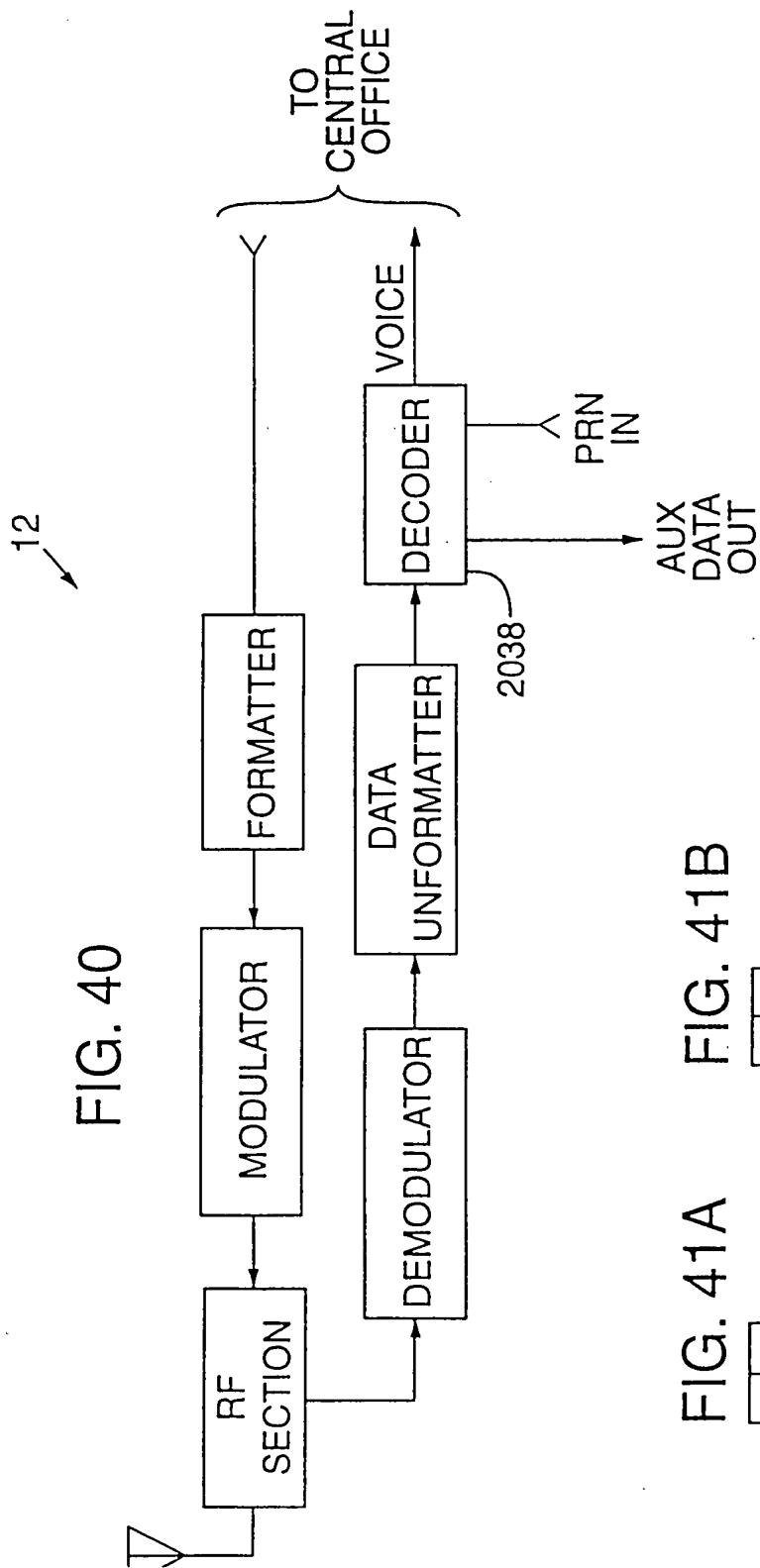


FIG. 41A

-	+
+	-

FIG. 41B

+	-
-	+

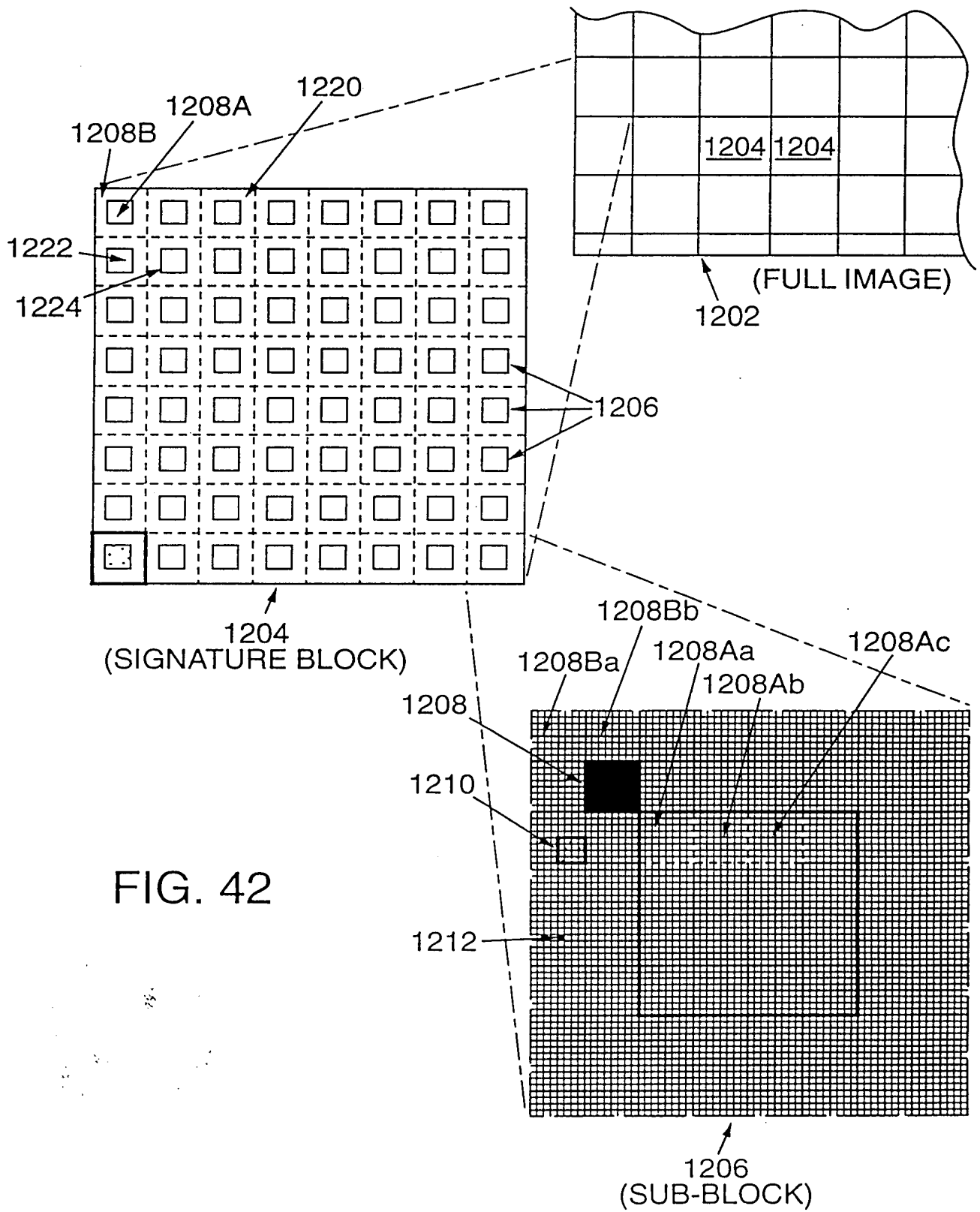
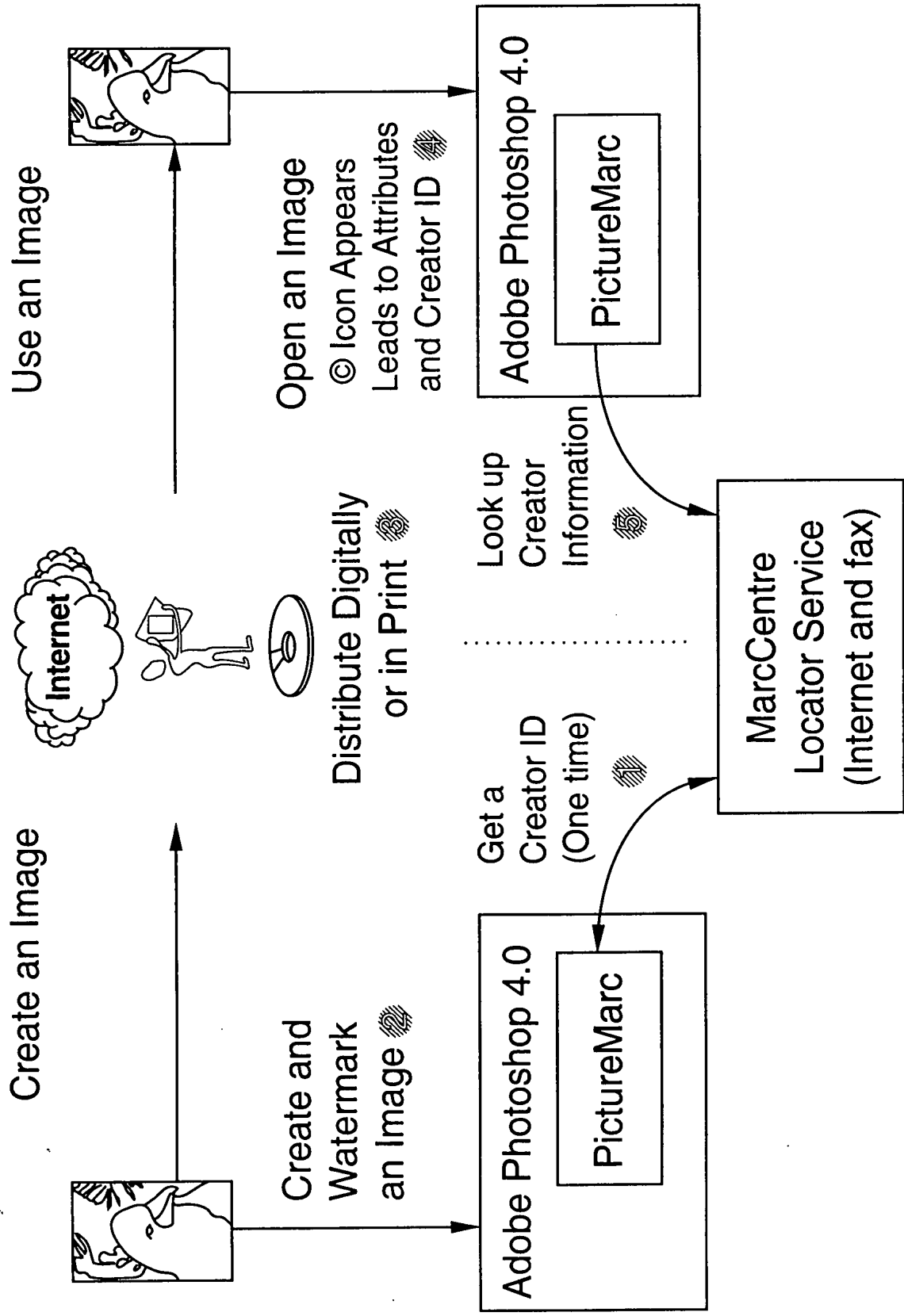
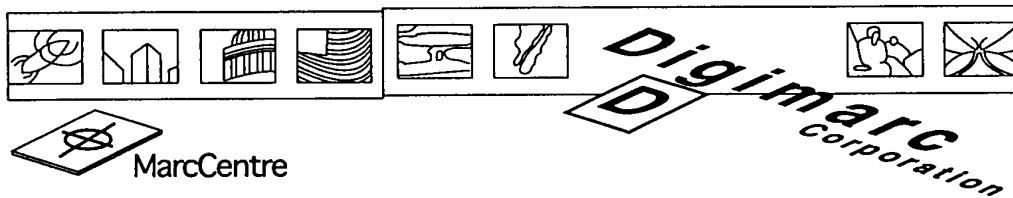


FIG. 42

FIG. 43





## Welcome to MarcCentre Digimarc's Locator Service

Photoshop 4.0  
Offer

MarcCentre is an on-line service which links your up-to-date contact information to every image you watermark. You provide the details you want consumers of your image to see. Each time someone reads one of your watermarked images, they can access this information about you and your work with a single mouse click.

Subscribe now to give each of your images a persistent identity, communicating your copyright, and bringing consumers directly to you. Take advantage of the special offers available to you now, for a limited time.



FIG. 44

To find out more about how MarcCentre works and how you can get started taking advantage of this locator service, browse the MarcCentre overview page.

If you are already a subscriber, you can go to Member Services to view or update your contact details.

To look up image creator/distributor information, you can search by creator ID or by other, more general, criteria.

For the technically minded, find out what's going on behind the scenes.

<a href="#">Creator Search</a>	<a href="#">Photoshop 4.0 Offer</a>	<a href="#">Special Offers</a>	 <a href="#">Digimarc Free Reader</a>
<a href="#">Member Services</a>	<a href="#">Subscribe</a>	<a href="#">Feedback</a>	 <a href="#">Home</a>

[Digimarc Copyright Notice](#) | [About the Site](#)



Thank you for signing up with MarcCentre. There are two parts to the application form (1) your contact information and (2) Agencies or Representative contact information. Simply fill in the blanks on this page and click "Part 1 Complete" below.

<b>Name (First/Last)</b>	<input type="text"/>
<b>Company</b>	<input type="text"/>
<b>Address</b>	<input type="text"/>
<b>City</b>	<input type="text"/>
<b>State/Province</b>	<input type="text"/>
<b>Zip/Postal Code</b>	<input type="text"/>
<b>Country</b>	<input type="text"/>
<b>Phone Number</b>	<input type="text"/>
<b>Fax Number</b>	<input type="text"/>
<b>Email Address</b>	<input type="text"/>
<b>Your Home Page</b>	<input type="text" value="http://"/>

FIG. 45

You can control how much of your contact information is displayed when a potential customer finds your profile on MarcCentre. Use the selections below to tell us what you want people to see.

**Phone Number**

- ☒ Show  
☐ Don't show

**Mailing Address**

- ☒ Show  
☐ Don't show

**Email Account**

- ☒ Show  
☐ Don't show

Yes, I want to be on your mailing lists ☒

Please select your profession (one only).

- ☒ Photographer  
☐ **Illustrator**  
☐ Other

In order to communicate your primary area of focus or specialty to potential customers, please select one of the options from the list below -or- type in your own in the space next to "Custom Specialty"

**Photographer**

**Illustrator**

**Custom Specialty**

Digimarc displays an Image of the Day showcase on our web site. Would you like to participate?

- ☒ Yes.  
☐ Not at this time.

For security purposes, you will need to setup a password that allows you to edit your profile information. This password along with your creator ID are required before you can update your contact information.

**Password Re-enter to verify**

--	--

The standard fee for the MarcCentre service is \$150 (US). From now until December 31st, 1996 you can subscribe for only \$79 (US), over 50% off the regular price!

For security reasons, the following credit card information is captured using secured sockets technology.

**Credit Card**

- ☒ Visa  
☐ MasterCard  
☐ American Express

**Card Number**

**Name Shown on Card**

**Expiration  
(MM/YY)**

--

--

--

When you are satisfied with your entries on this form press the "Part 1 Complete" button and continue with the second part of the subscription sign-up. If you wish to cancel, press the Back button on your browser.

Part 1 Complete

Digimarc Copyright Notice

FIG. 46

FIG. 47

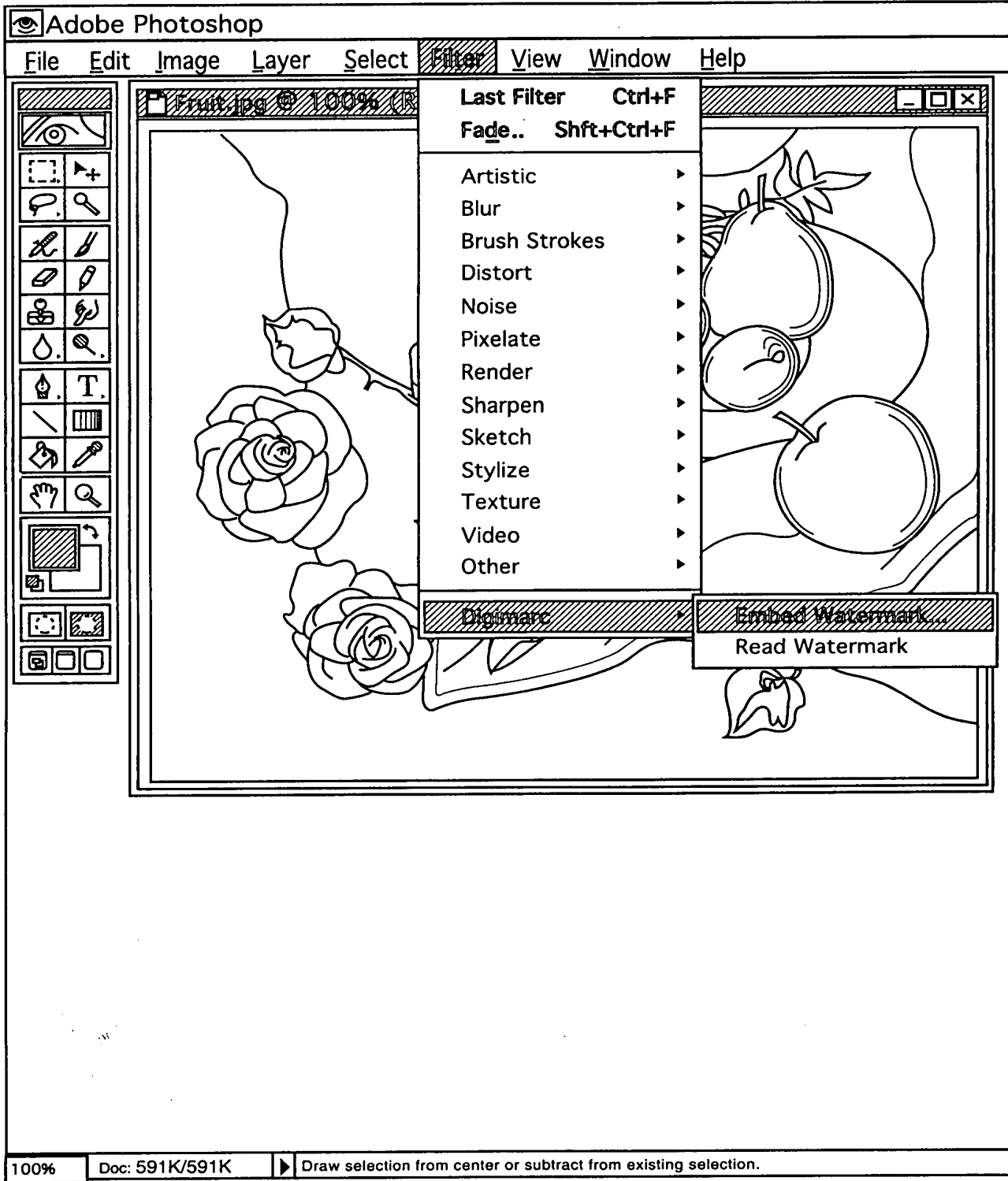


FIG. 48

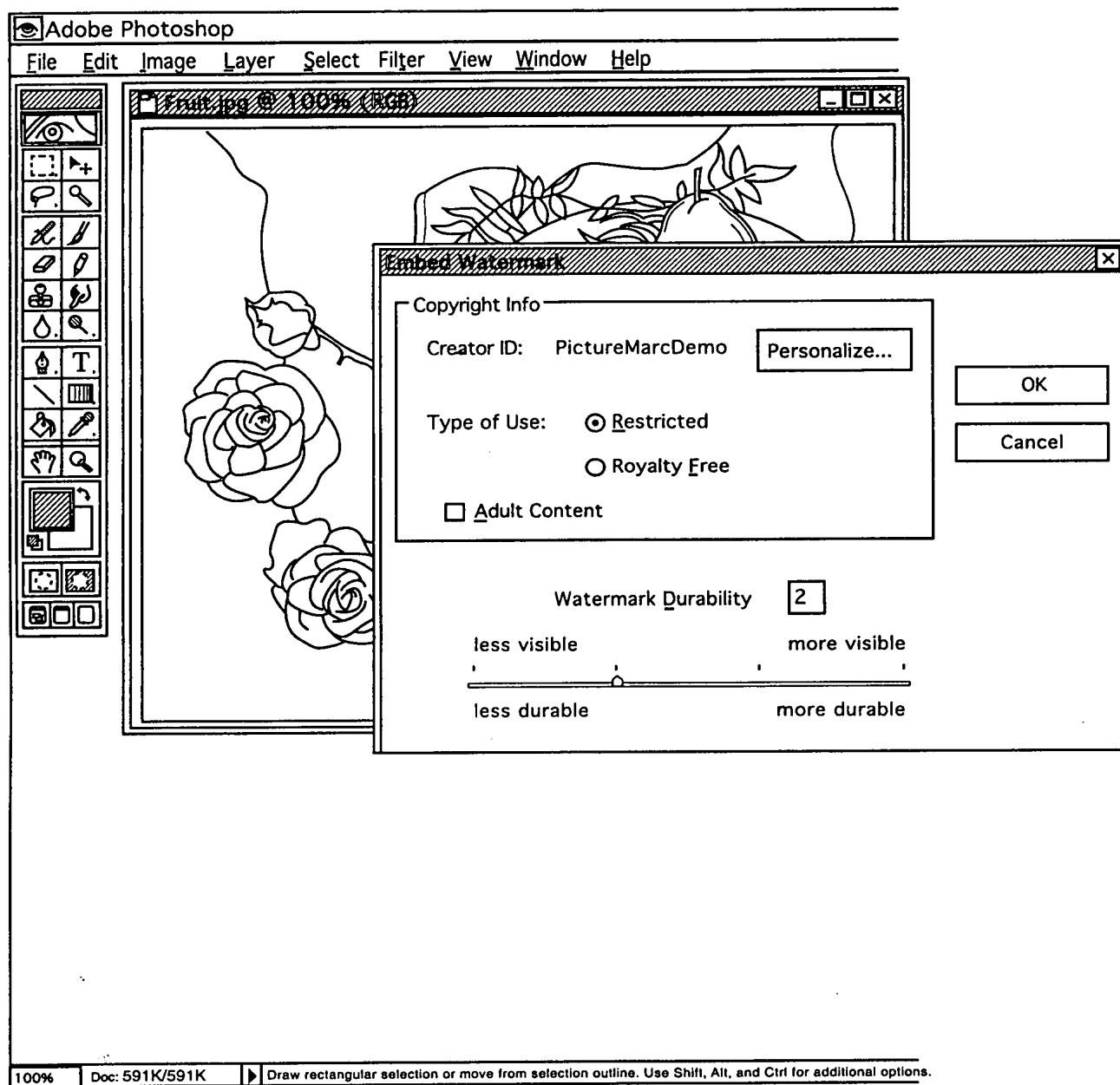




FIG. 49

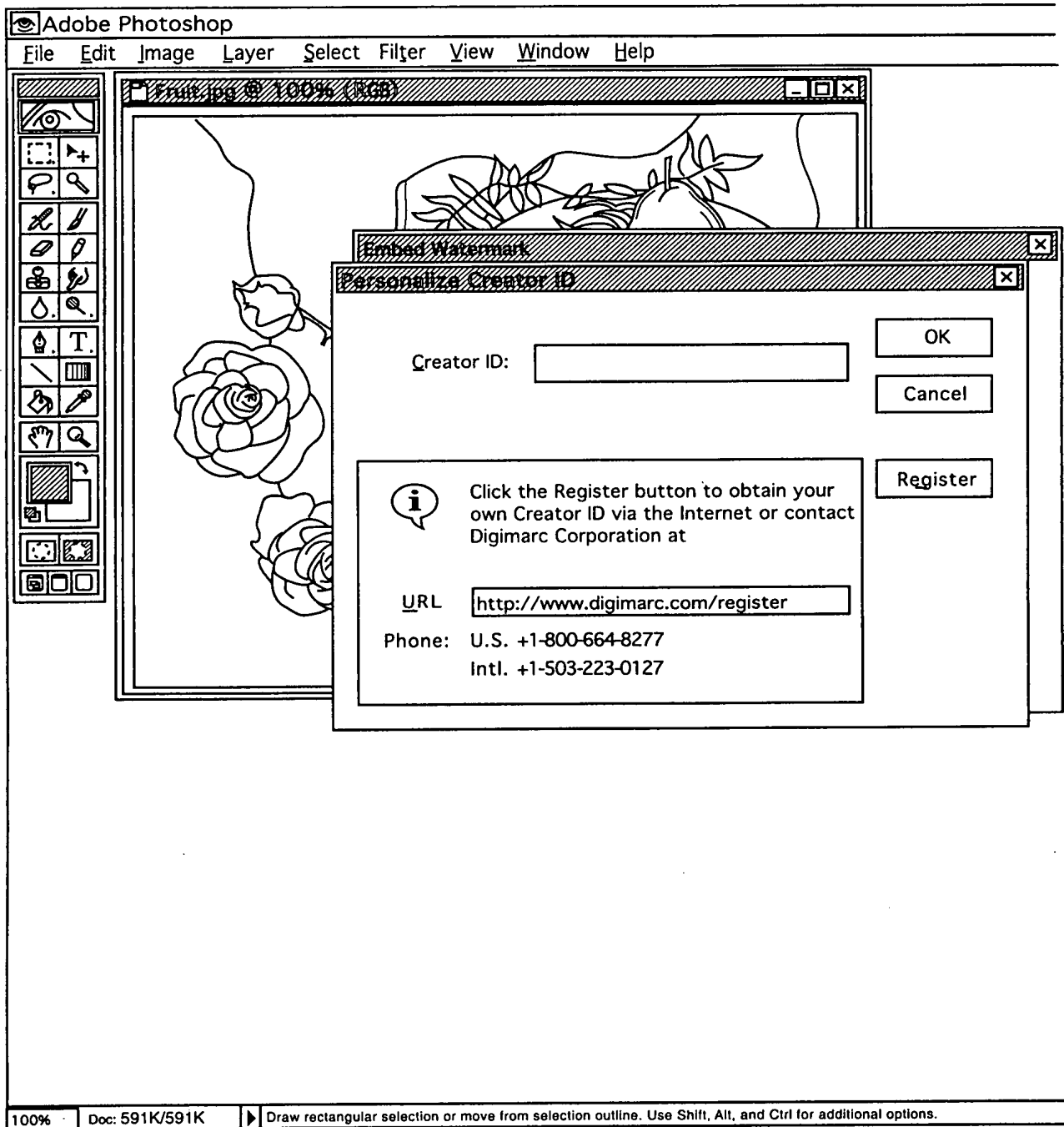


FIG. 50

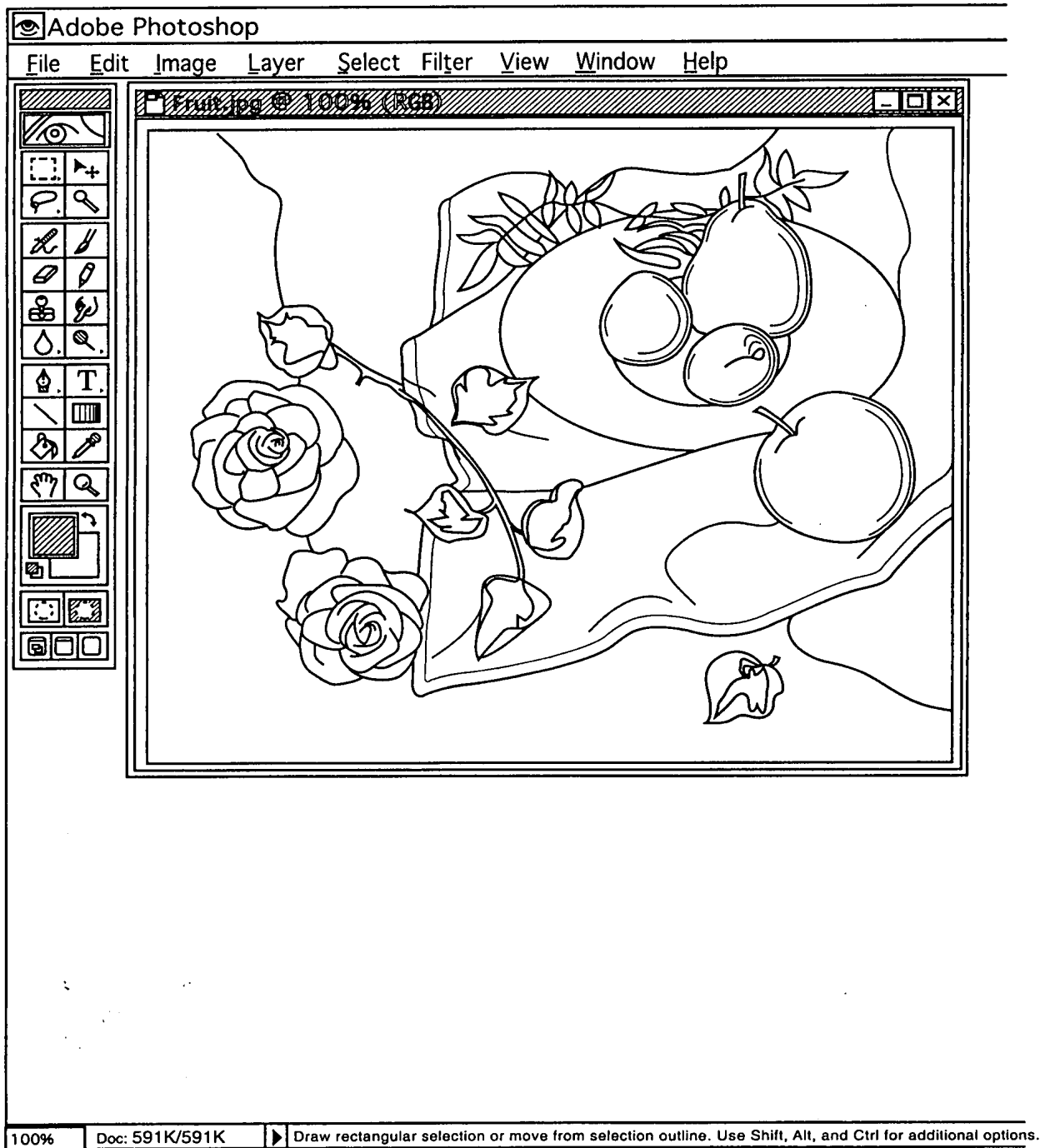
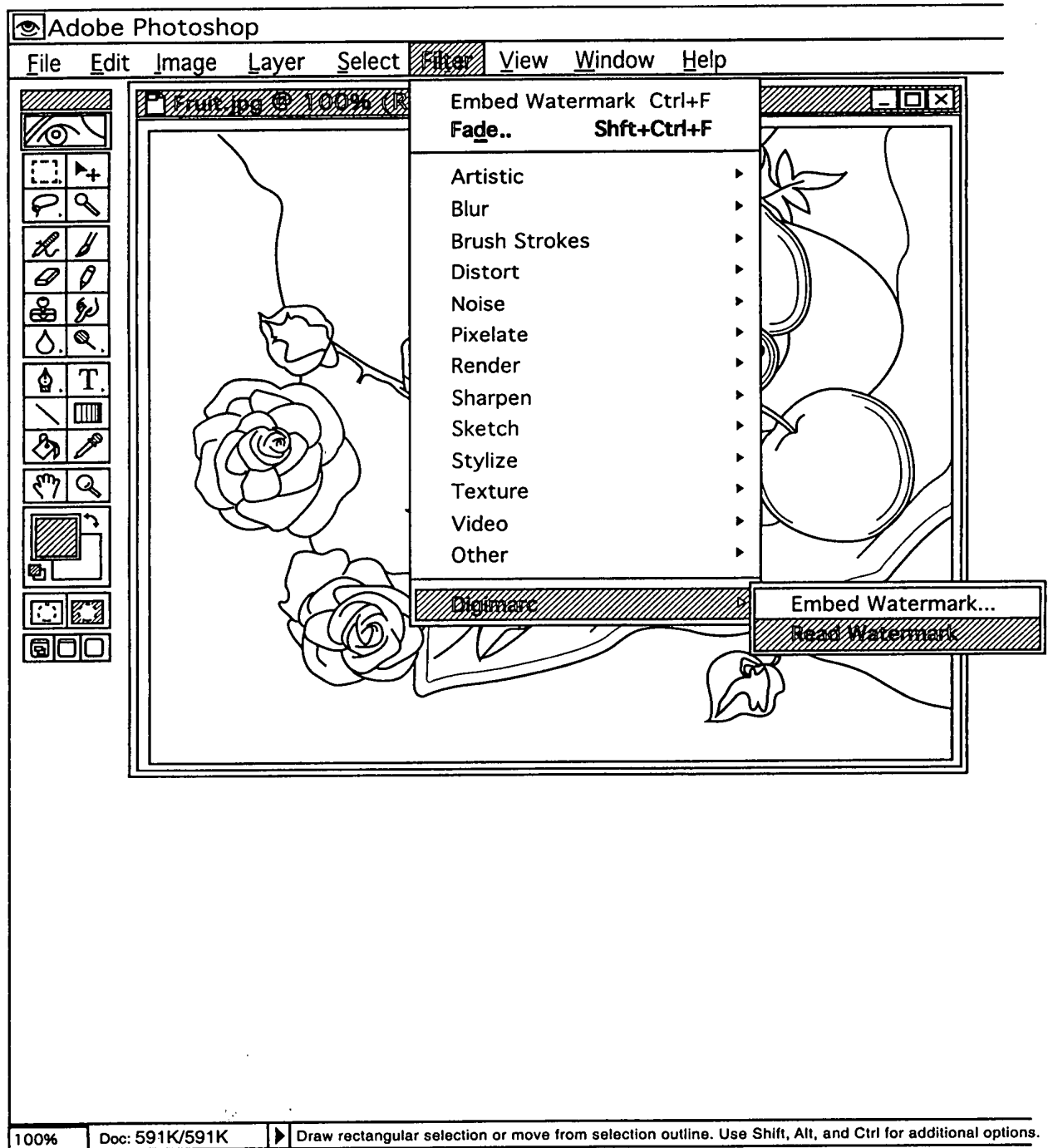


FIG. 51



# FIG. 52

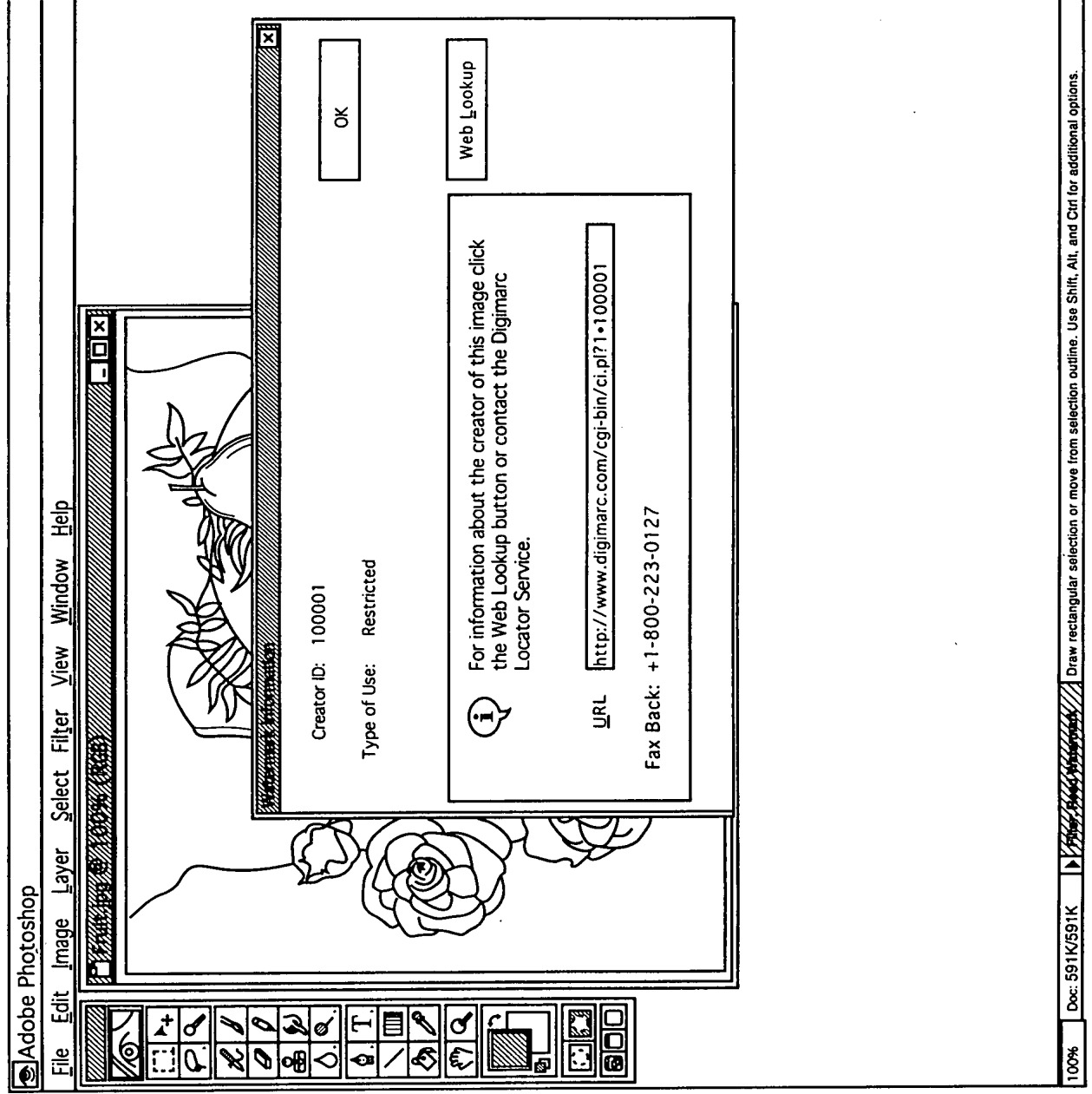
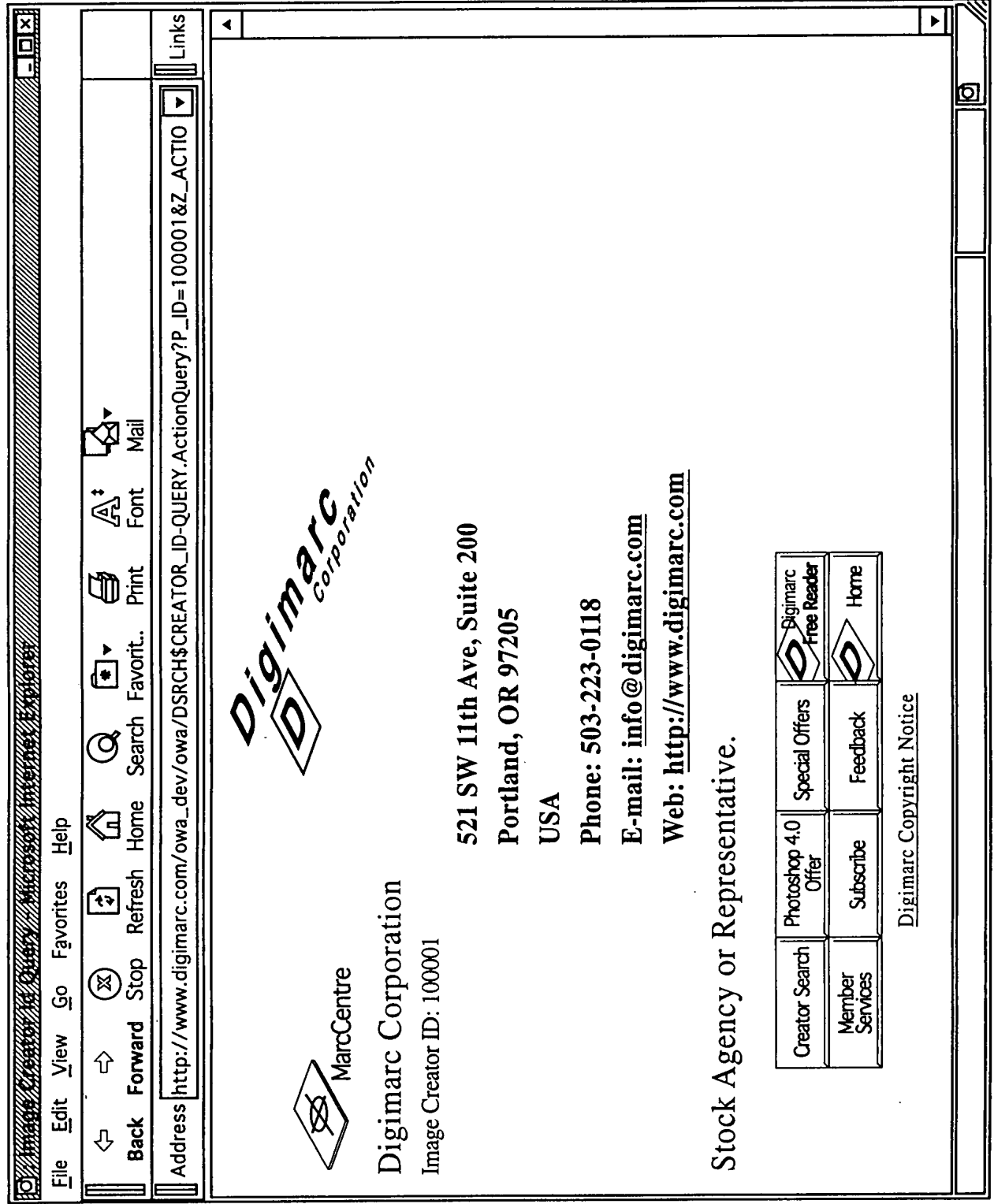


FIG. 53





## MarcCentre Image Creator Search



Enter the Image Creator ID in the box below and press "Submit Search". If it is a valid ID, the contact information details will be listed.

**Image Creator ID:**

Submit Search

If you want to search for specific image creators by a variety of criteria such as last name, specialty, city and/or state then press the "General Search" button below.

General Search

Creator Search	Photoshop 4.0 Offer	Special Offers	 Digimarc Free Reader
Member Services	Subscribe	Feedback	 Home

[Digimarc Copyright Notice](#)

FIG. 54

FIG. 55

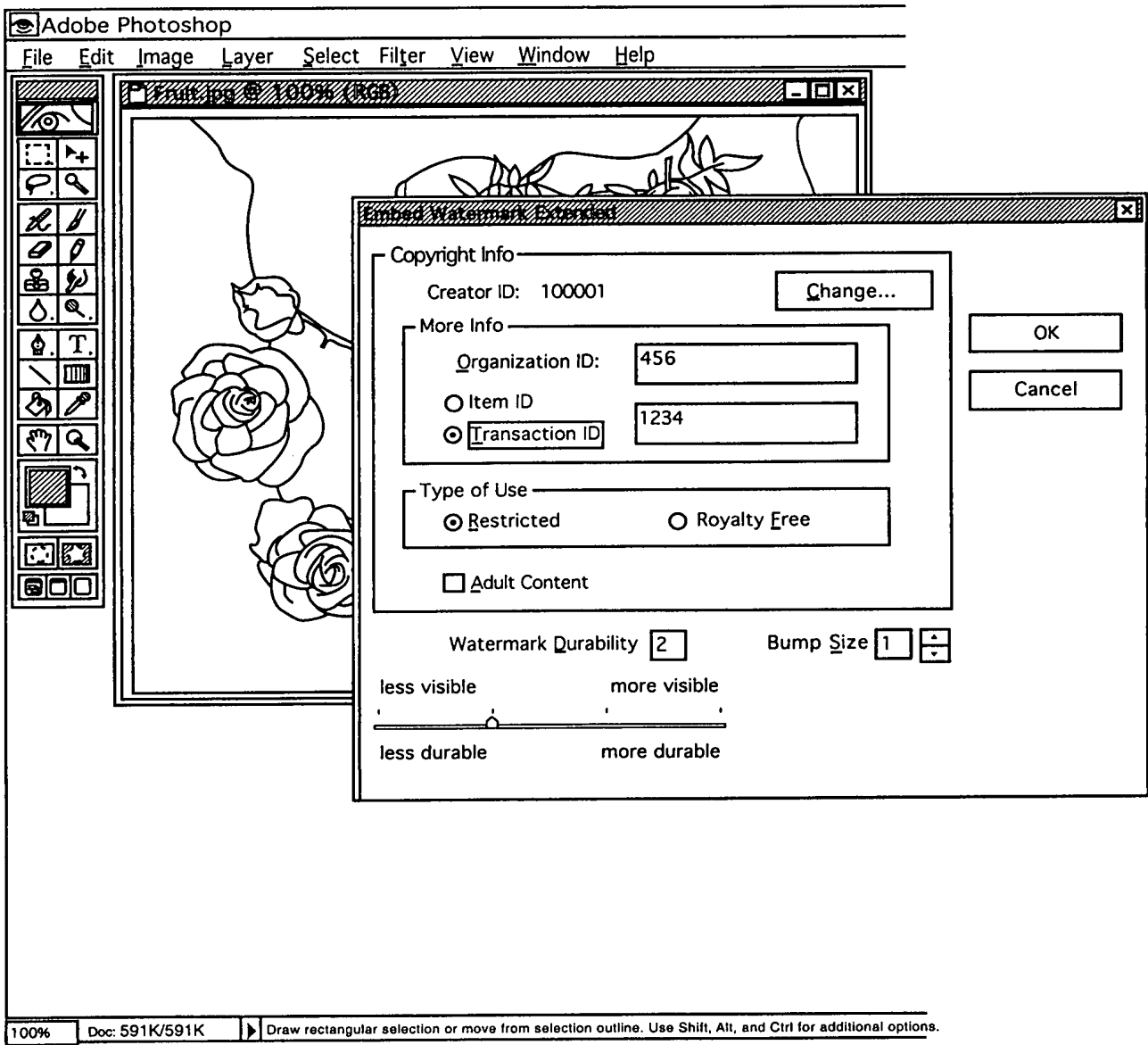


FIG. 56

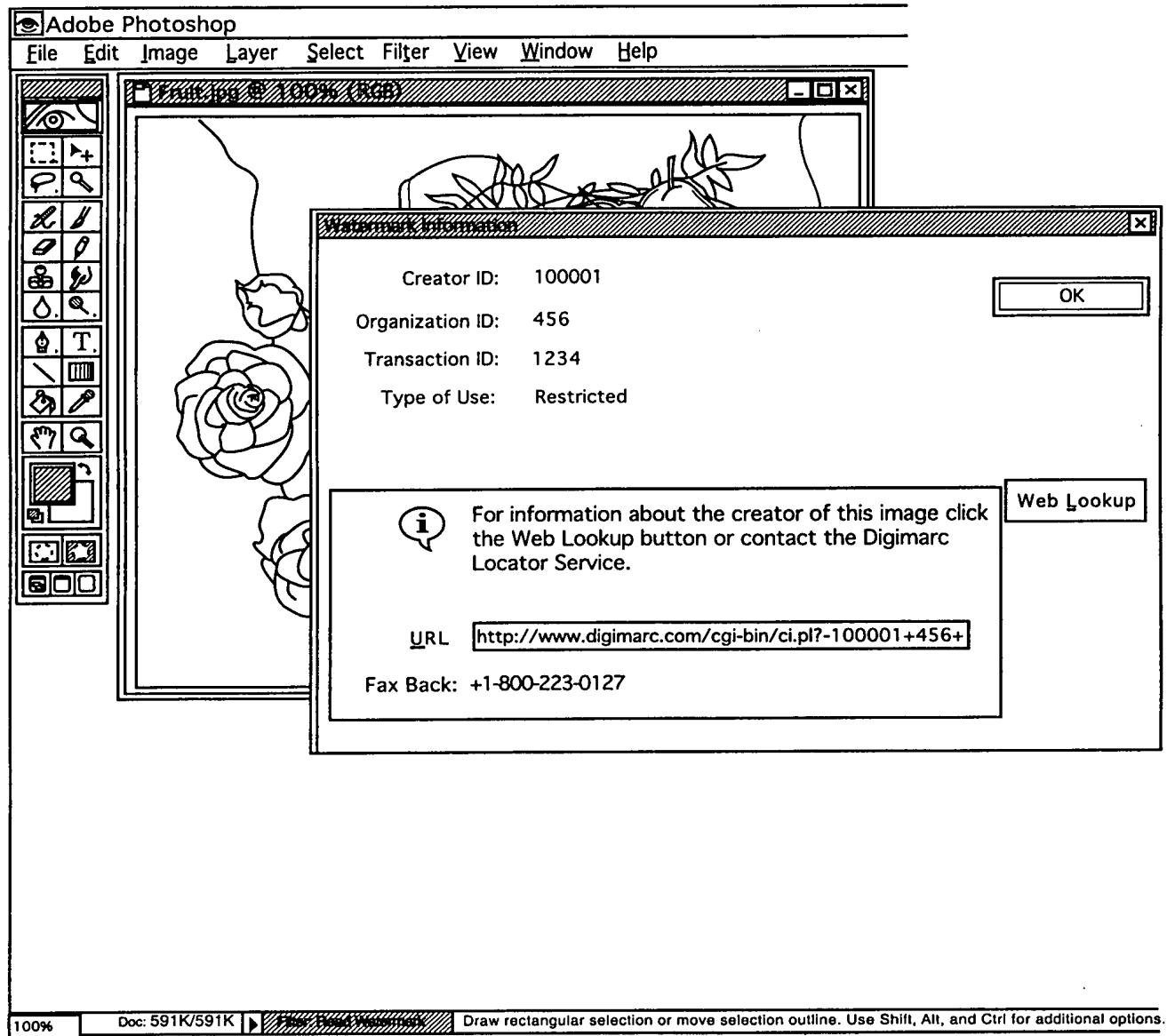




FIG. 57

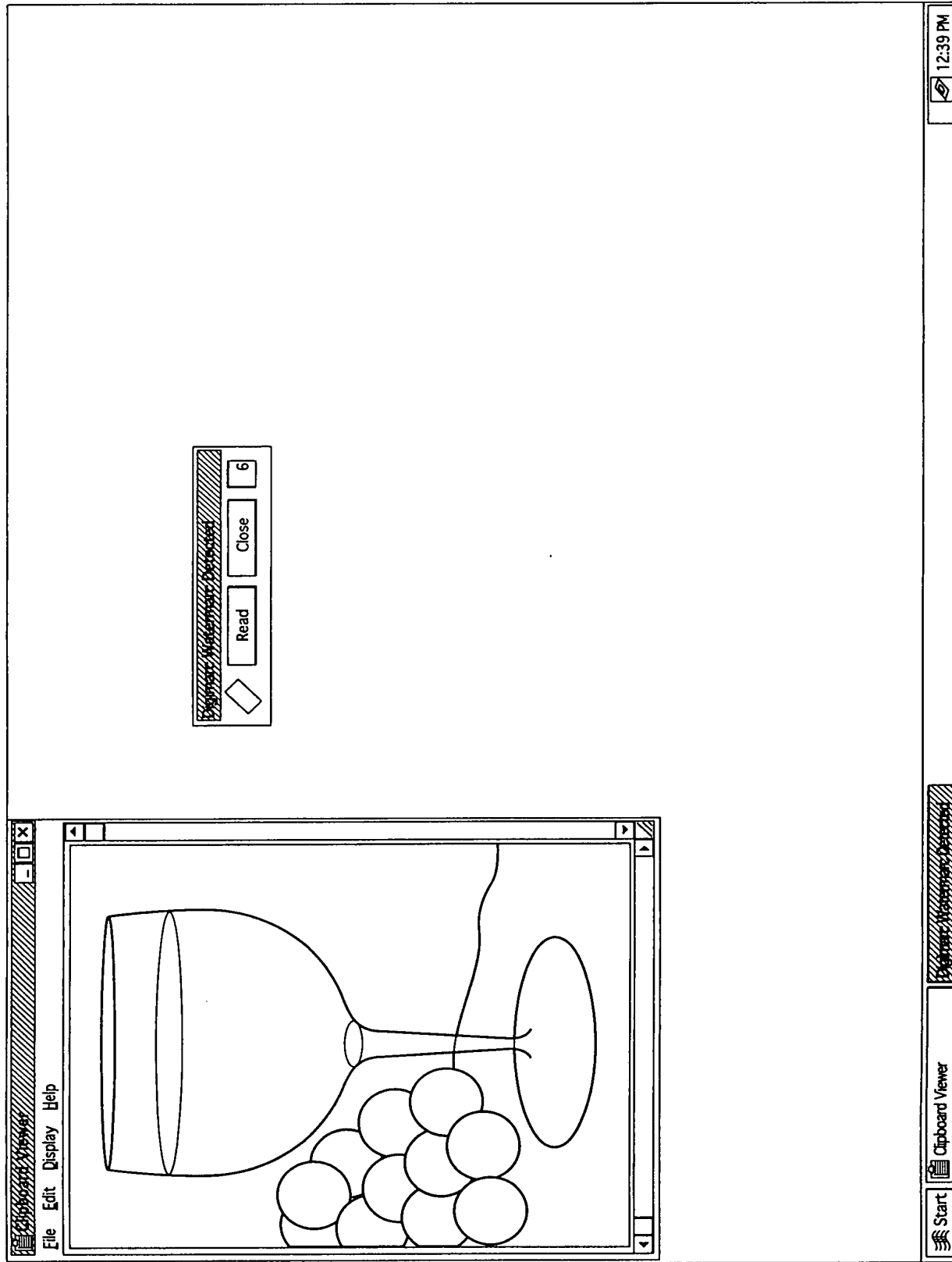


FIG. 58

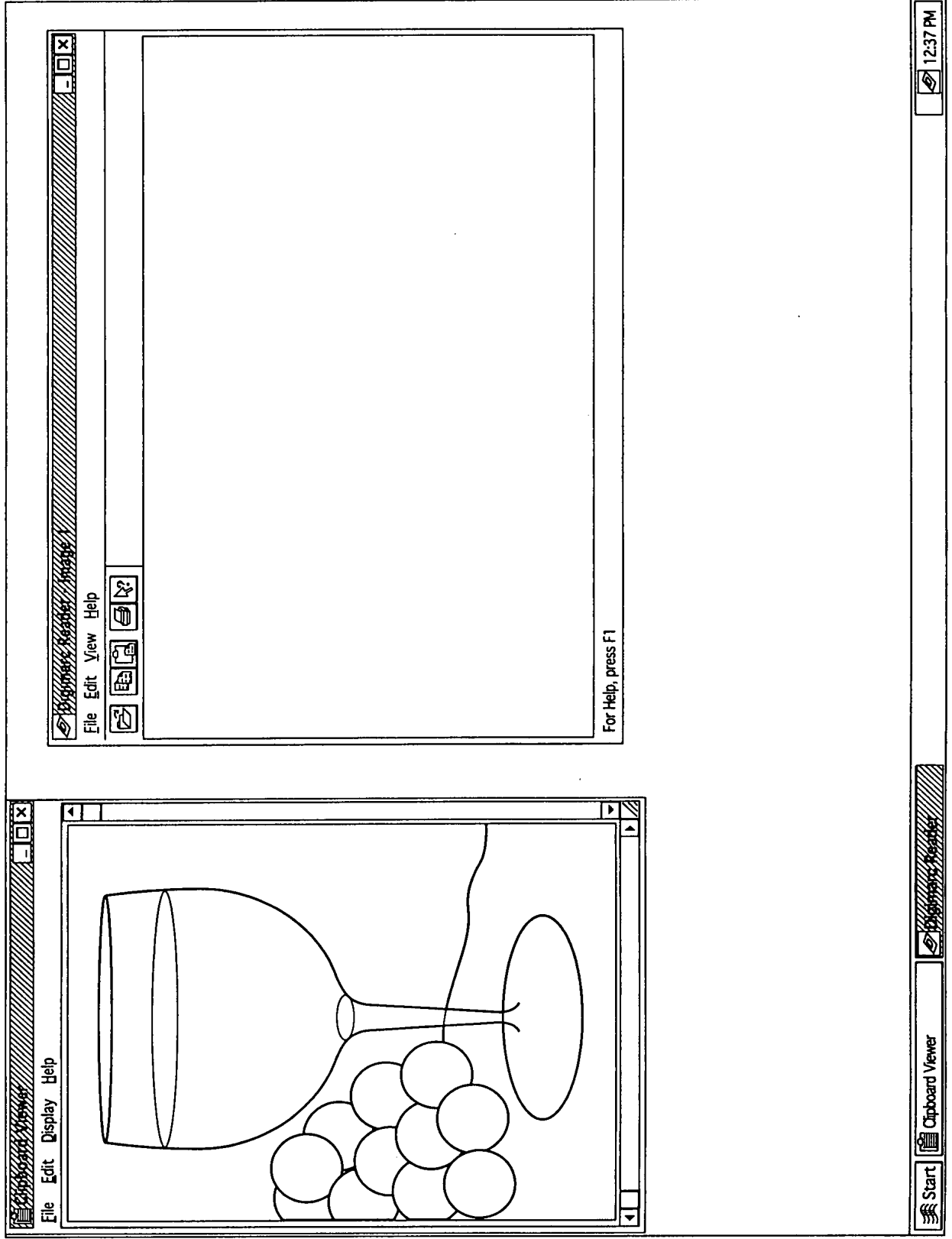


FIG. 59

